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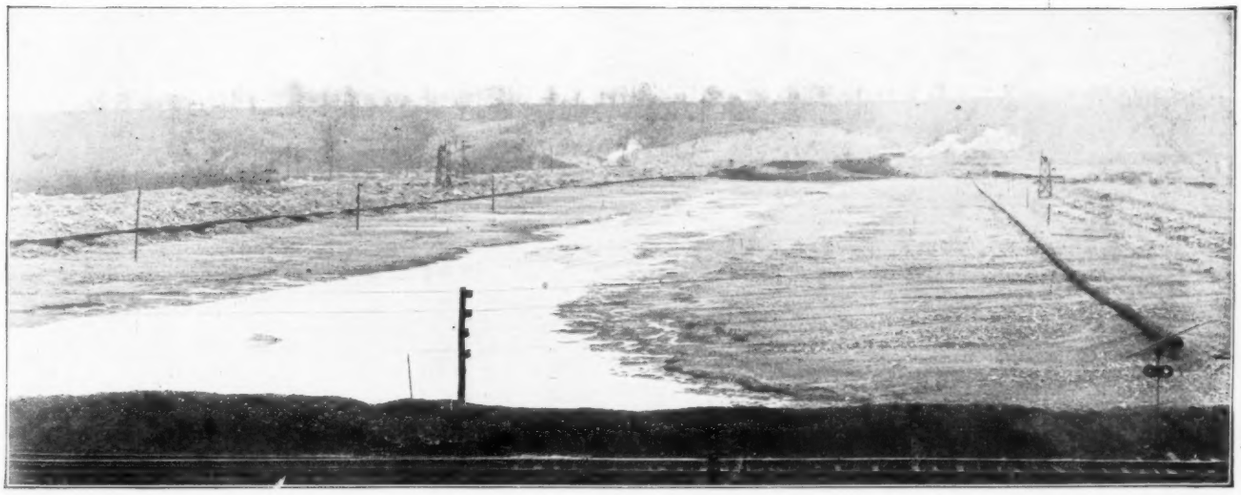

CORE POOL AND BEACHES, TAYLORSVILLE DAM

Showing hydraulic pipes on upper sides of both beaches, near the levees.

IN THIS ISSUE:

The Water Supply of Tulsa
Forms for Motor Sweeping Cost Keeping
Hydraulic Fill Dams for Miami Conservancy District
Bituminous Paving Suggestions
Asphalt Paving in Oklahoma City
Shall We Import Chinese Labor?
Recent Legal Decisions

NEW YORK, MAY 15, 1920

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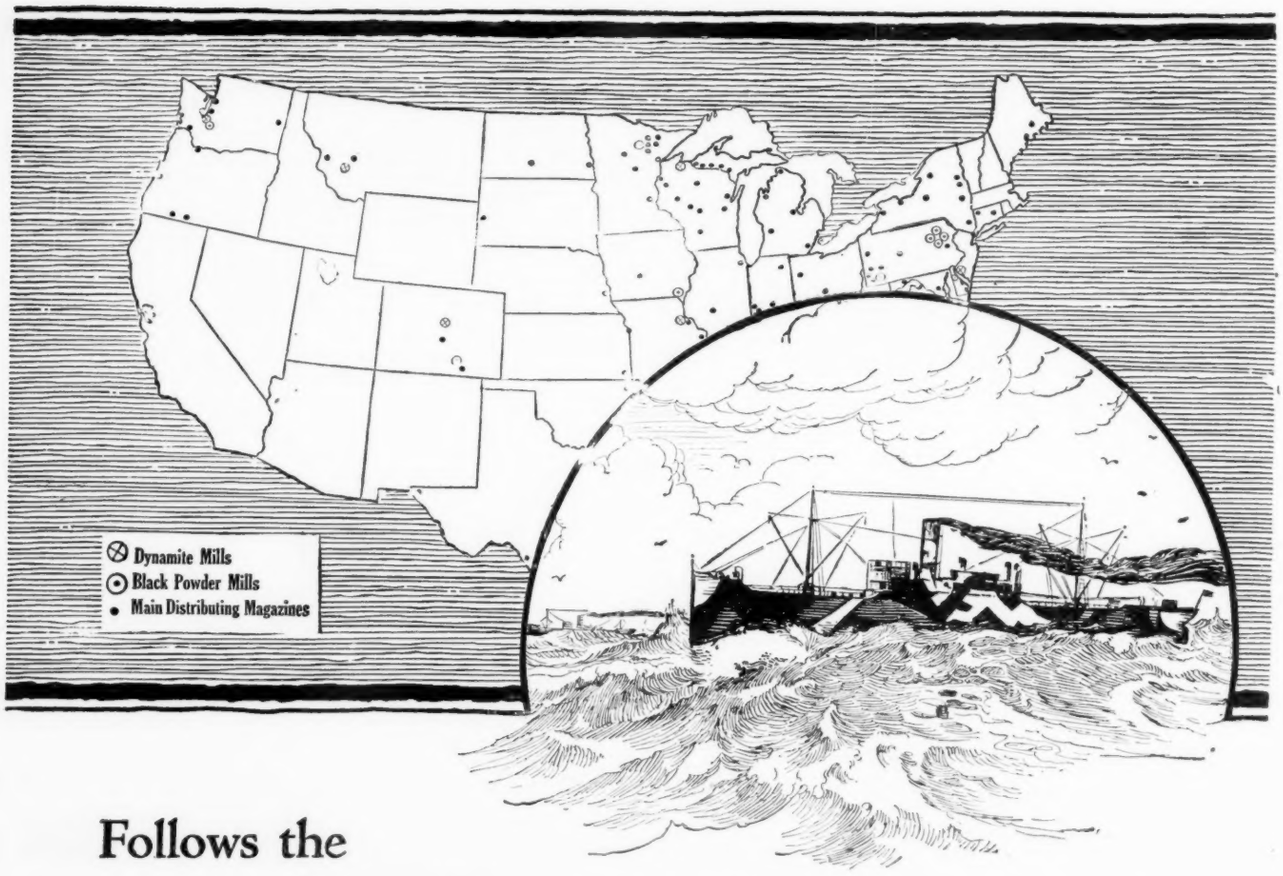

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CITY COUNTY STATE

A Combination of "MUNICIPAL JOURNAL AND PUBLIC WORKS" and "CONTRACTING"

Vol. 48 NEW YORK, MAY 15, 1920 No. 18

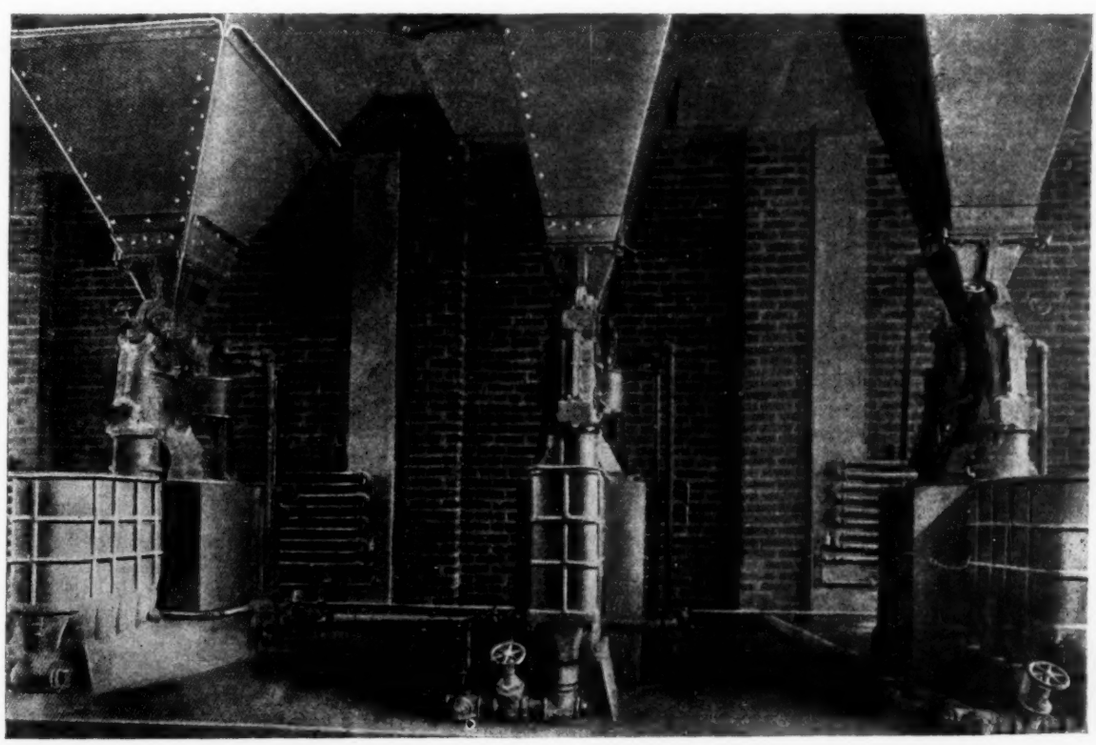
The Water Supply of Tulsa

By H. N. Roberts*

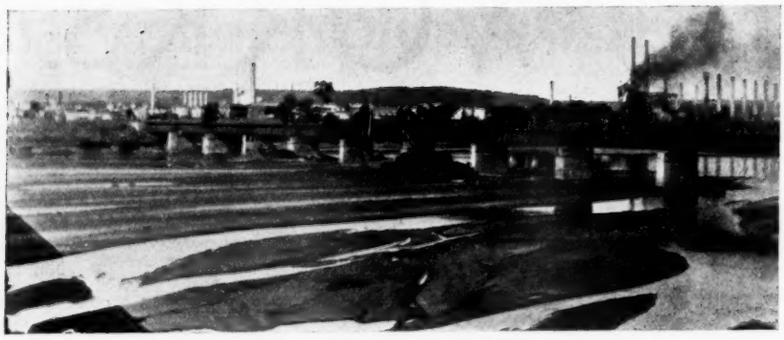
The rapid growth and the difficult conditions found in Oklahoma present unusual problems. Filtration is employed, dry chemical feed being used. In 1919 new pumps, mains and intake were installed. It is proposed to obtain a supply from an Ozark mountain stream, building a dam fifty-five miles away, at an estimated cost of five and a half million dollars

The city of Tulsa, Oklahoma, the oil center of the Southwest, if not of the world, where, a few short years ago, prairie dogs, Indians and jackrabbits reigned supreme, has in recent years commenced to grow in that phenomenal way which seems possible only to the great oil cities of recent years. Skyscrapers shoot up seemingly over night, and the dreary wastes of yesterday become the busy, throbbing, twentieth century city of today, where money comes easily and goes even more easily. In 1915 with a population of about 25,000 people, the census of 1920 will undoubtedly show 85,000 inhabitants, and it is estimated that in 1945 the population will reach 170,000.

* Formerly Construction Engineer for the Tulsa, Okla., Water Dept.



DRY-FEED CHEMICAL MACHINES, TULSA FILTRATION PLANT.



ARKANSAS RIVER, SHOWING DRIFTING CHANNEL.

To a rapidly growing city the question of water supply is a very important one and requires the foresight of able engineers in order that the supply may ever keep pace with a rapidly increasing demand from industries, domestic requirements and fire protection. Water supply in Oklahoma is a much more difficult problem than in the northern and eastern United States, as the light rainfall and rapid evaporation rate, combined with the scarcity of large forests, render the supply from wells not very dependable; and the flowing streams of the region generally contain such large quantities of mineral salts as to render them undesirable for industrial and domestic waters. And Tulsa must have the best! The new supply, for which bonds in the amount of $5,000,000 were voted last July, will be suitable to the demands of the most discriminating Tulsan, and will be described in this article.

Prior to 1918 the supply of the city was furnished from wells in the southwestern part of the city, augmented by water taken from the Arkansas river, on the banks of which the present plant is situated. The Arkansas river water was settled and coagulated but not filtered.

In 1917 the firm of Archer and Stevens was retained by the city as consulting engineers, and designed a filtration plant to have four filter beds of a maximum capacity of 1¼ million gallons per day each. This plant was completed and placed in successful operation in the early part of 1918. In the design of this plant the most modern appliances were used. A master meter automatically controlled all chemical feed, use being made of the dry feed machines of the Pittsburg Filter Mfg. Co. (who were contractors on the filter equipment).

QUALITY OF WATER.

The Arkansas river water contains large quantities of mineral salts, oil and bacteria. From 100 p.p.m. to 1,000 p.p.m. sodium chloride (or common salt) are found in the water and, as this cannot be removed, the water is suitable for industrial and domestic purposes for only a few months in the year. When the salt content rises above about 500 p.p.m., which occurs for some three months of the year, its taste is very marked and it is not desirable for drinking purposes. The oil scum from the refineries is not troublesome and its removal seems to be mostly effected by the formation of balls on the surface of the mixing chamber in the corners and in the influent flume to the filters just ahead of the skimming weir from the settling basins. As the raw water is also somewhat polluted by sewage, it is a very difficult water to handle, requiring constant and efficient chemical and bacterial control.

MAINTAINING CHANNEL TO OLD INTAKE.

Probably very few plants have to deal with a water as bad as this, and when softening is resorted to with the use of soda ash and lime, which will give an effluent with a total hardness of about 140 p.p.m., the chemical cost is quite high. When soda ash is not used and when softening is not resorted to, the total hardness of filter effluent is from 300 to 700 p.p.m. as calcium carbonate, but is uniformly clear and of low bacterial count.

CHEMICAL FEED.

The dry-feed machines used consist of a cylinder with scored or milled surface, onto which the dry chemicals are fed from an opening in the bottom of a large hopper containing the chemical, and whose upper part is charged from the chemical storage room above. The hopper contains slowly revolving paddles to prevent the bridging of the chemicals. The drum is actuated by a water motor whose speed is governed by a water line connected with the venturi meter tube in the raw water line in such a manner that the speed of the drum is at all times proportional to the rate of discharge through the raw water line to the basins. In this manner the drum feeds down over its surface an amount of dry chemical determined by the adjustment, and varying with the flow of raw water. The dry chemical is then mixed with the water discharge from the water motors and carried in open troughs to the point of application in the mixing chamber.

The mixing chamber typifies the best design, consisting of horizontal and vertical baffles (the vertical baffles being removable) and is very efficient. The troughs can be moved about at will and by trial the most economical and effective point for the introduction of the chemical can be found. The economical point is in a great measure dependent on the condition of the raw water, but in general the lime is applied at the entrance to the mixing chamber, most of the coagulation being produced by it. The iron solution is added almost at the end of the mixing chamber, the water having quite a heavy "floc" before the addition of the iron.

To one who has used both methods of feeding chemicals, it is at once apparent that the dry method of feeding, eliminating as it does the bugbear of filtration plant superintendents — the clogging of chemical solution lines, is much the superior of the two. Especially with lime is the dry feed almost imperative and necessary for satisfactory and uniform results.

The filter rate controllers are also of the automatic type, and the rate of filtration is automatically varied up to the maximum, depending upon the depth of the water in the clear well.

INTAKE TROUBLES.

The bed of the Arkansas river consists of a very fine sand, which drifts with the rise and fall of the river and the changing currents. The old intake, which was a 21-inch vitrified clay pipe line, had been left some 600 or 800 feet inland by the vagaries of the shifting currents and shore line of the river, and this channel had to be kept open by a centrifugal pump dredge boat and at times by teams and men at quite a large expense. A new intake line had been contemplated for 1918, but war conditions and insufficient funds made this impossible. In the early part of 1919, however, a contract was let to the Lantry-Fike Construction Co. for the construction of a new intake line consisting of some 400 feet of 30-inch bell and spigot cast-iron pipe to a manhole on the shore line, and about 400 feet of 30-inch spiral riveted pipe to an intake tower on an island, where deep water had always been maintained and a careful study of the currents seemed to indicate the continuance of a deep channel at this point.

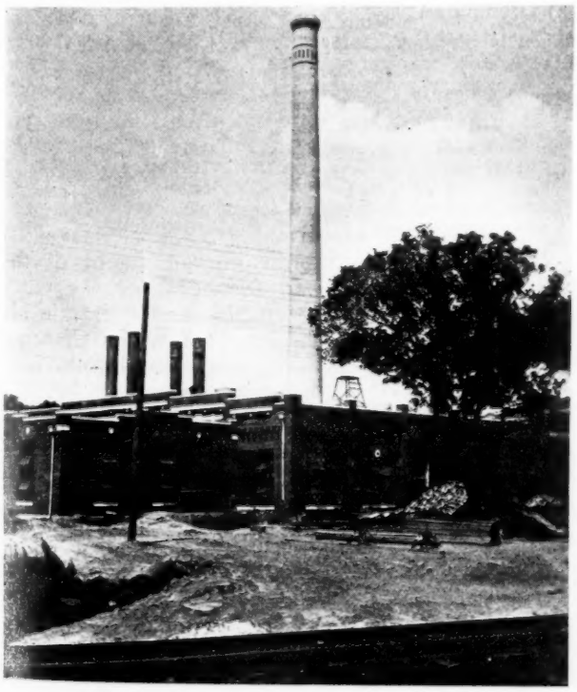
Before the new intake and line had been completed and put in operation, the maximum capacity of the old line had dropped to only some 4,500,000 gallons per day and low water was 6 inches below the top of the 21-inch intake pipe. The peak pumping load at about 7 p. m. was close to the rate of 8,000,000 gallons per day, although the maximum day's pumpage was only 6,000,000 gallons on June 17th. Therefore, to meet the emergency, a motor-driven centrifugal pump was set up on the river bank delivering the deficiency of about one and one-half million gallons per day. By the fall of 1919, however, the new intake and flow line had been completed and this emergency had passed.

OTHER 1919 IMPROVEMENTS.

During 1919 there were installed at the river plant a new 8 m.g.d. steam-driven centrifugal pump for the raw water, two 200-h.p. return tubular boilers, and a 150-foot concrete stack, and two new 1¼-m.g.d. filter beds were constructed.

As the high-lift pumps were of 10 m.g.d. combined maximum capacity (one a 4 m.g.d. Platt and the other a 6 m.g.d. Allis-Chalmers) and as an 8 m.g.d. maximum rate is expected in the summer of 1920, in order to be adequately prepared for the possibility of one of these high-service pumping engines being laid out of service for repairs, and to insure fire protection, bids were requested on a 12 m.g.d. pumping engine in the early part of 1919. The cost of this engine was estimated to be about $80,000. Bids were finally received and opened, the contract being let to the Allis-Chalmers Company, which guaranteed a duty of over 140,000,000 foot pounds per 1,000 pounds of dry steam, as was required in the specifications.

During 1919 about 19 miles of new mains were laid at a cost of approximately $400,000, in size of from 4 inches to 24 inches. Tests made in the business district in 1919 showed that the 20-inch and 24-inch lines from the plant were capable of delivering an adequate supply from the plant, but that more cross connections from the 24-inch line, and more cross lines to complete the gridironing, would be required, in addition to the $400,000 spent in 1919, to render the necessary fire streams avail-



TULSA WATERWORKS PUMPING STATION.

FILTER PLANT, SETTLING BASINS AND PUMPING STATION.

able to all high-value districts. To illustrate the increased demands on a plant in a city of such rapid growth, the following table is given, which also shows the low and constant average rate per capita of population:

Year	Consumption, Average Daily Pumpage	Population Supplied	Gallons per Capita
1916.....	2,543,000	38,000	67
1917.....	3,058,000	46,000	67
1918.....	3,719,000	54,000	69
*1918.....	6,079,349	54,000	112
*1920.....Est.	8,000,000	71,500	112

* Max. pump.

FUTURE SUPPLY.

The fact that the present Arkansas river supply is not at all times suitable for an industrial and domestic supply, principally on account of the salt content and the great industrial growth of the city, combined with the discriminating tastes of the many families of wealth in Tulsa, combine to make imperative the utilizing of another source of supply that does not have these defects. In the latter part of 1918 Chas. C. Hubbard, the mayor, with his commission, having a vision of the greater Tulsa of the future, retained Henry A. Pressey to report on a new source of supply.

In the early spring of 1919 Mr. Pressey filed with the Commission his report and estimate of cost, recommending the selection of Spavinaw creek with a 55 mile conduit as the most advisable supply for the city. Spavinaw creek has its source in the Ozark mountains of Arkansas, and is an exceptionally beautiful stream for Oklahoma, the water being almost crystal clear, with a total hardness of from 100 to 140 p.p.m., free from sodium chloride and practically free from pollution. It has a drainage area of about 400 square miles and without question will furnish a supply sufficient for a population of 250,000 people. The rainfall on this watershed is somewhat greater than the average in Oklahoma, averaging about 45 inches yearly. This rainfall over the drainage area is estimated to yield 121 billion gallons of water yearly. To make use of this large run-off it would be necessary to build a dam whose crest is 50 feet above the tail water. The reservoir thus created will store approximately eleven billion gallons of water and cover some 1,250 acres of land. The allowable drawdown of the reservoir should not exceed 3¾ billion gallons, or 10 feet of water below the spillway of the dam. A greater drawdown of the reservoir would require auxiliary pumping. After carefully working out a mass curve using government records of rainfall for each month over a period of eleven years, it is found that, with the assumed storage, it would have been necessary to use auxiliary power only 53 days per year for the 11 years, when the city is using 10 m.g.d., and for 102 days when consuming 15 m.g.d. For 7 m.g.d. no auxiliary pumping would be necessary, as the flow will furnish sufficient water to generate power for pumping.

The site of the proposed dam is about 3½ miles above the mouth of Spavinaw creek, where it empties into the Grand river. Natural reservoir locations exist at several points along the proposed conduit line and these are at sufficient elevations to give the water a gravity flow to the various pumping stations. There are to be three line reservoirs of 20 million gallons capacity and one on the outskirts of the city of 80 million gallons capacity. There will be three pumping plants on the line and a pumping and generating plant at the dam with a steam reserve. All line pumping plants are to be motor driven and the power for their operation will be generated at the dam plant. For periods requiring the use of auxiliary power, the steam reserve plant at the dam will supply this, or the transmission line will be connected at the city end with the power lines of one of the power companies doing business in Tulsa. From the last reservoir the water will flow by gravity to the present pumping plant at the river. An emergency intake will be constructed on the line at the crossing of the Grand river.

An estimate of the cost of the proposed new Spavinaw supply would be about as follows:

Dam and power house	$255,900.00
Right of way	50,000.00
Conduits and pipe line	3,105,600.00
Large reservoir	404,700.00
Three line reservoirs	300,000.00
Power plant	225,000.00
Pumping plants	150,000.00
Transmission line	360,000.00
Houses for operators	10,000.00
Land and clearing	150,000.00
	$5,011,700.00
Engineering	250,500.00
Interest during construction	150,000.00
	$5,412,200.00

Estimated operating costs when using Spavinaw supply in conjunction with present pumping plant:

		Cents per 1,000 Gallons at 7 m.g.d.	at 10 m.g.d.
(a)	Supply	0.72	0.51
(b)	Pumping { Fuel.... 0.90 0.88 / Chem... 0.08 0.08 }	0.98	0.96
(c)	Distribution	1.71	1.20
(d)	Administration expense	0.77	0.54
(e)	Auxiliary pumping	0.86	1.17
	Total operating	5.04	4.38
(f)	Depreciation	1.24	0.87
(g)	Interest	10.62	7.41
	Total overall cost (cents per m. gal.)	16.90	12.76

Chas H. Hubbard is the present mayor of the city and to his zeal and foresight for the city's future welfare, with the efficient and energetic aid of the Chamber of Commerce (of which Clarence B. Douglas is secretary) is principally due the success of the $5,000,000 bond issue voted on July 10, 1919. R. E. Curran is water commissioner and during 1919 the writer was engaged as construction engineer under Mr. Curran.

State highways constructed and planned under bond issues in California for the six counties of Del Norte, Humboldt, Mendocino, Lake, Sonoma and Marin total 553.86 miles. Of these 226.47 have been completed, many miles are practically complete and work has begun on all. The expenditures of the six counties to March first total $3,722,378.

Forms for Motor Sweeper Cost Keeping

By John Townshend Child *

Methods and forms devised in Rochester, N. Y., for keeping cost records of street sweepers for aid in controlling work, making budget estimates, comparing and purchasing equipment, and determining special assessments.

After several years of experience in cost keeping work of various kinds, there seems no way out of the conclusion that there should be some standardization of cost keeping methods if cities are to compare their cost records with any degree of satisfaction or value. Cost records of various kinds are usually kept, but seldom are they in any way adequate or complete, or are they tied in with any controlling accounts. Often when costs are wanted on any particular function or piece of apparatus, it requires a great deal of digging into various records and usually ends up with an estimate of certain minor cost items.

It has been the practice of bureaus of municipal research to obtain cost data for all kinds of equipment from other cities and bureaus. In comparing the results obtained, it was found that a great deal had to be taken for granted and that in any instance the figures were not comparable at all on account of the lack of detailed and supporting information, not to mention the different methods of cost keeping. This is very evident also in technical magazine articles. Those whose duty it is to compile cost data complain that the man on the job, such as foreman or machine operator, whose main duties are not clerical, does not turn in accurate or reliable figures, and so the compiler is handicapped at the start and has little faith in the results he gets. This may be a reason, but it is not a good excuse, as it can be overcome to a large degree by training and discipline.

As Rochester has purchased a new kind of street sweeping equipment, an effort has been made to devise cost keeping forms which will in reality cover every cost item connected with it. It is certainly desirable to keep accurate cost records for a trial period at least, and it would seem even more worth while to continue such records for full years or seasons in order to get complete and balanced performance data. At the end of that time it will be possible to really know just what a machine can do and how much it costs under given conditions. If it does not come up to expectations, the reasons therefor will be obvious from the records and the purchase of future equipment can then be made more intelligently.

DAILY REPORT SHEET.

The first form shown herewith was drawn up as a daily report sheet, to be made out mainly by the operator (or inspector, if there happens to be one), and covers the work of one machine. The amount of fuel put into a machine on any given day does not mean anything so far as the amount of work is concerned; but if this record be kept up for a number of days, the actual amount of fuel used can be averaged up and is then of a great deal of value in figuring operating costs.

For the last year and a half an effort has been

* Assistant Engineer, Rochester Bureau of Municipal Research.

BUREAU OF _____

CITY OF _____ _____, 192__.

DAILY REPORT - MOTOR SWEEPER

Machine No. _____ Fuel - gal. gas _____ No. Hoppers Dumped

Shift __ A.M. to __ M. qts. oil _____

__ P.M. to __ M. Tanks water

Weather _____ Speedometer Readings At Finish _____

Repairs _____ hrs. " " At Start _____

Miles per Shift _____

STREETS SWEPT

Street	No. Trips	Dump Location

Remarks - (Dirt and Traffic Conditions)

_____ Operator or Inspector.

FORM FOR DAILY REPORT.

Bureau of _____ Season of 192__ City of _____

MONTHLY SUMMARIES. MOTOR SWEEPER COST ANALYSIS

Machine No. ___ Make _____ First put in Operation ___ 192 __ Cost (delivered)_____

Cost	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Totals
Operator										
Gas										
Oil and Grease										
Water*										
Brooms										
Repts.,Paints,&c.										
Total Operating										
Supervision and Inspection										
Insurance										
Depreciation*										
Interest*										
Total Cost										
Operating Data and Unit Costs										
1000 Yds. swept										
Cost per 1000 Yds										
No. 8-hr.shifts operated										
Cost per shift										
Miles traveled										
Cost per mile										
No. tanks water										
No. hoppers dmpd.										
Dirt pickedup c.y.										
Dirt / shift cu.yd.										

*Depreciation = cost $ ___ x 12.5% ___ = ___ nos. used per yr.

*Interest = cost $ ___ x rate ___ = ___ 12 months

*Water rate = _____ per 1000 gal.

Capacity - water tank _____ gal. hopper _____ cu. yds.

_____ Clerk

FORM FOR MONTHLY SUMMARY.

made to obtain information concerning the operation of motor sweepers, and out of the 15 or 20 cities reporting not one could or did give the actual number of hoppers of dirt picked up or the tanks of water actually used. Many cities do not figure water as a cost item, but it certainly should be taken into consideration in any case, as it amounts to about $60 per season for motor sweepers. The amount of dirt picked up is valuable in comparing the cost of motor sweeping with hand work. On the daily forms are squares in which the number of tanks of water used and the number of hoppers filled may be checked off. In most cities the fuel used and the speedometer readings are also reported on the daily garage sheets, so that actual fuel, grease and oil costs may be obtained from them.

Number of Trips Per Street.—Another important item in figuring out street cleaning costs is the number of trips made by the machine on a given street. With each width of broom there is a minimum number of trips which would be necessary to cover a given street. The accompanying chart shows the number of trips necessary for the different widths of brooms on different widths of streets for the

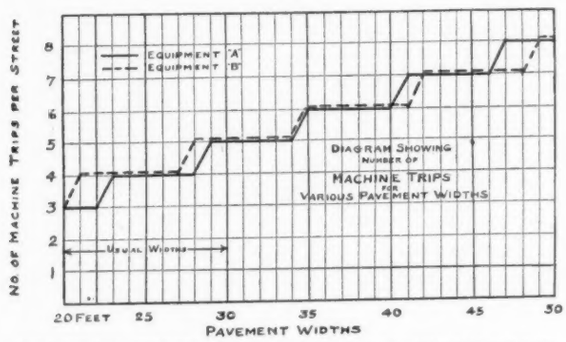


DIAGRAM SHOWING NUMBER OF MACHINE TRIPS FOR EACH OF SEVERAL PAVEMENT WIDTHS.

WIDTHS SWEPT BY DIFFERENT EQUIPMENTS.

Trip	Case A—7 ft. Broom plus 18 in. Gutter Equip. Width Swept per Trip—Feet	Totals	Case B—7 ft. Gutter Sweeper plus 8 ft. Pickup Sweeper Width Swept per Trip—Feet	Totals
1st	8.5	8.5	7	7
2nd	8.5	17	7	14
3rd	5	22	6	20
4th	6	28	7	27
5th	6	34	7	34
6th	6	40	7	41
7th	6	46	7	48
8th	6	52	7	55

Note:—First two trips only are made with gutter attachment or machine. One trip requires laps on both sides, hence is one foot less.

AMOUNT OF UNNECESSARY OVERLAP, IN FEET, FOR DIFFERENT WIDTHS OF STREETS.

Case A.

Widths of Streets	20	21	22	23	24	25	26	27	28	29	30
Overlap	2	1	0	5	4	3	2	1	0	5	4
Widths of Streets	31	32	33	34	35	36	37	38	39	40	
Overlap	3	2	1	0	5	4	3	2	1	0	
Widths of Streets	41	42	43	44	45	46	47	48	49	50	
Overlap	5	4	3	2	1	0	5	4	3	2	

Case B.

Widths of Streets	20	21	22	23	24	25	26	27	28	29	30
Overlap	0	6	5	4	3	2	1	0	6	5	4
Widths of Streets	31	32	33	34	35	36	37	38	39	40	
Overlap	3	2	1	0	6	5	4	3	2	1	
Widths of Streets	41	42	43	44	45	46	47	48	49	50	
Overlap	0	6	5	4	3	2	1	0	6	5	

equipment now on the market. It also shows at which widths the changes become necessary and the table gives the amount of unnecessary lapping. Such a table should be used in laying out routes for motor sweepers. A prevailing width of pavement might be a deciding factor in purchasing equipment with a certain length broom.

The ratio of first costs is 3 for Equipment A to 4¼ for Equipment B. Significant facts, as shown by the chart, are that at pavement widths of 21, 22 and 28 feet, Equipment A requires one machine trip less to sweep the entire pavement than Equipment B. The same number of machine trips is necessary for all other widths up to 50 feet except 41, 47 and 48 feet, where the reverse is true. At pavement widths where the same number of trips is necessary in either case, the work can all be done by Equipment A with the same power unit, while Equipment B requires one motor sweeper for the two gutter trips and another for the remaining trips. However, the gutter machine costs less and is cheaper to operate than the Equipment A machine.

Dumping Dirt.—A question which causes a great deal of confusion in comparing cost figures is the actual method or place of dumping dirt picked up by mechanical sweepers. If dumps are handy, it is much cheaper to have the machine itself carry the load to a given place, but it is not economical to have the sweepers go any considerable distance to do so. If dumps are not near by, the material must be dropped on the street and later picked up by a pick-up team, which of course makes an additional cost. The method or place actually used is seldom reported, hence the last column on the daily form.

The area and kind of pavements are not shown on the form because they can readily be picked off the office records in the department by a clerk and there is no need for duplicating the work or making extra or unnecessary field work.

Dirt and Traffic Conditions.—It seems advisable to have a few lines for remarks on these daily forms to cover dirt and traffic conditions. For instance, if there are a large number of automobiles parked on a given street, it is impossible for the motor sweeper to work along the gutters, where three-fourths of the dirt is usually located. When such conditions occur, it probably would be advisable to shift the machine to some other street or have the work done on that street at night or some other hour. A few notes would explain why certain streets were not cleaned and account for delays and changes.

MONTHLY SUMMARIES.

The second cost sheet is designed for monthly summaries so that the records for a season may be summed up on one sheet and the actual unit costs figured for an appreciable period and an average struck off. The blank gives space for the date the machine was put in operation, which is frequently wanted and seldom recorded. The same is true of the price, from which the depreciation and interest should be figured. It has often been necessary to dig into records several years old to find out the cost of certain apparatus, and very often the results obtained are only approximate or dependent on some one's memory.

In addition to the operating cost, there should be some definite way of computing overhead expenses, because cost data, as usually handed out, do not state whether only operating costs are included or whether they cover overhead expenses or not. If they do include overhead, it is often difficult to decide how it is figured. On the form shown there are spaces for all necessary items, and below is given the method of arriving at these items, together with spaces for the local rate for water and the capacities of the water tank and the hopper, which are seldom given and frequently not known accurately unless a catalogue is handy.

Many untrained officials do not realize the value of cost keeping or else do not care to spend the money for it. Others have the records kept, but they are so out of date when completed that much of their value has gone. Cost records are valuable in controlling work, in making adequate budget estimates, in comparing and purchasing equipment, and in determining special assessments, but they must be kept up to date and be accurate and complete.

City Planning Legislation

The efforts of the Chicago City Club to secure beneficial state legislation for city planning have resulted in the formation of a city planning committee which has drafted a preliminary outline of needed city planning legislation and widely circulated it throughout the country to city planners, with a request for criticisms. Subsequently the chairman of the committee was appointed to a new committee on State Constitution intended to promote the consideration of the city planning subject, and the city club has appointed a new committee on city planning legislation which includes representation of the zoning committee of the city club.

The zoning subject is considered to be the most important one now in the field of city planning and the City Club has suggested a form for the new zoning commission and has participated in the organization of the citizens' zone plan conference, which latter, however, failed in its attempt to secure the control of the building height limit which, despite their protests, has been increased by the city council.

Hydraulic-Fill Dams for Miami Conservancy District

Conclusion of article in last week's issue. Description of method of building up the levees, beaches and water-tight core by means of steam shovels, "window" pipes and other contrivances.

DEPOSITION OF HYDRAULIC FILL.

The Miami hydraulic fill dams are built either as a continuous structure, handled in a single section and in uninterrupted operation from end to end of the longitudinal axis, as at Germantown (where the flow of Twin Creek passes through the dam in a covered culvert, permitting the embankment to be built over it); or in successive sections, as at Englewood, where the dam could not be raised high enough the first season to carry it over the conduit for the Stillwater river, and it was necessary to build the lower portion of it on opposite sides of the river in two separate sections, which could not be joined until after the first season's work had been completed. In both cases, the method of procedure and the operations are substantially the same as those here described and illustrated with photographs of the Lockington, Englewood, Germantown and Taylorsville dams.

The dam is composed of a number of similar horizontal strata extending across the full width and length and consisting of three longitudinal elements. The first element is a pair of levees with trapezoidal cross-sections, usually about 8 feet high, each of them located with one inclined surface in the upper or lower slope of the finished dam and having some of the coarsest material, namely gravel and small boulders, on its outer face. The second elements, adjacent to the levees, are also trapezoidal in cross-section, with their long parallel sides from 2½ to 4 feet apart vertically and inclined downwards slightly from the levee to the axis of the dam. These two elements and the levees symmetrically arranged on opposite sides of the axis, form the bottom and edges of a very wide shallow upper trough and a narrower and deeper concentric trough which latter, for each stratum, is

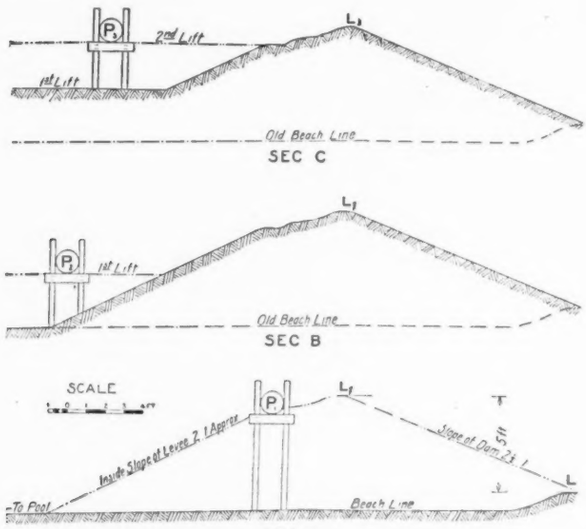
Type with wide Core. Sides subject to falling into Core

Type with narrow Core. Sides of superior stability

HYDRAULIC FILLS WITH DIFFERENT RATIOS OF CORE TO SHOULDERS WIDTH.

TYPICAL CROSS-SECTION OF HYDRAULIC FILL DAM.

filled to about the full thickness of the stratum with a horizontal layer of the very finest material precipitated from the water delivered by the dredge pump. As the height of the dam is increased the thickness of the strata and the size of the levees remain approximately constant, while the relative width of the second and third elements, the beaches and core, varies so as to maintain the width of the core about equal to the vertical distance from it to the crest of the dam.



SUCCESSIVE POSITIONS OF DISCHARGE PIPE FOR BUILDING ONE 8-FOOT LEVEE AND TWO 4-FOOT LIFTS OF SHOULDER AND BEACH.

The end of the discharge pipe is supported on trestles at a height of 4 feet, corresponding to the thickness required for the stratum. The larger stones up to 6 inches in diameter drop from the mouth of the pipe and quickly form a conical heap as high as the bottom of the pipe, over which the water flows in every direction carrying the remaining stones and other solid materials with it and soon building up the surface to the under side of the pipe in the rear and building a flat slope from the pipe to the levee and in the opposite direction for a long distance toward the center of the pool until all of the sand and fine gravel have been deposited and the slope terminates along a well-defined line, where the inclination becomes much steeper, marking the inner edge of the shoulder. Sheer boards are set up edgewise near the end of the pipe to divert most of the water transversely toward the axis of the dam, where it runs in small streams, dropping the sand and gravel as it goes but retaining the fine sediment until it reaches the sharper slope, where it falls into the center pool and, becoming quiet, deposits most of the sediment as fine, soft silt in a nearly horizontal plane.

As soon as the sand and gravel have been built up to the bottom of the pipe, an additional 16-foot section of the pipe is connected on, and the process is repeated to the opposite end of the dam, building up the shoulder the full length of the levee and forming a wide, flat slope with the steeper inside edge called the "Beach."

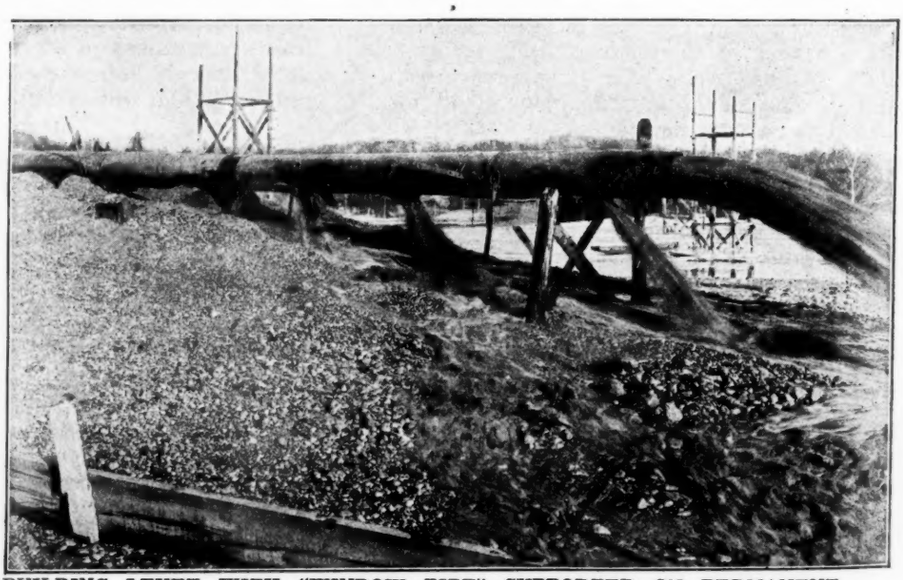
BUILDING THE LEVEES.

Usually two pipe lines are in simultaneous operation, one on each slope of the dam, and the attendants are so fully occupied in handling them that they have not sufficient time to build the levees by hand, in which case the latter are constructed principally by the use of small drag-line excavators moving along with caterpillar traction on the smooth, solid gravel beach a little in advance of the pipe discharge.

On the Englewood dam, type 36 Marion machines with 40-foot and 50-foot booms and 1½-yard buckets precede the dredge pipe outlets, digging up enough coarse material deposited by them on the previous trip to build levees 8 feet high so as to serve for two strata of the beach. The draglines place the material in the levees and outer slopes of the dam embankment so well that very little hand dressing is necessary.

Six men are necessary to quickly shift the sections of the discharge pipe, and at Taylorsville, where only one pipe is operated, these men have sufficient idle time between shifts to build the levees by hand. This work is facilitated, however, by a special device called the "window pipe," which deposits the larger stones in a line of small piles close together under the pipe, so that they can be raked or shoveled to place in the levees with minimum labor.

Six 16-foot lengths of "window pipe" each have



BUILDING LEVEE WITH "WINDOW PIPE" SUPPORTED ON PERMANENT TRESTLES AT END OF DISCHARGE PIPE.

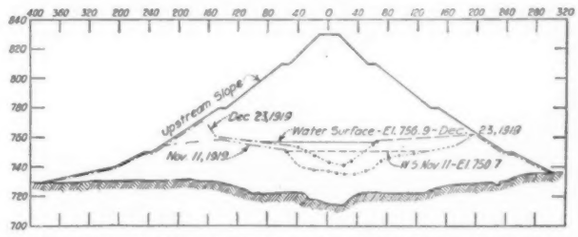
three 4x6-inch rectangular holes on the lower side, the long dimensions being parallel with the axis of the pipe. The solid material, passing through with a velocity of 15 feet per second, is most of it carried over the holes, but enough sand and gravel to make the levee drops through in the 96 feet of perforated pipe, the position of which is shifted three times for the construction of one section of levee.

At first the pipe is installed as indicated in section A, 5 feet above the surface of the beach on a rough timber trestle 4 feet eccentric from the axis of the levee at L, the position of the old levee being shown farther at the right in the outer slope of the dam at point L. In this position the levee is filled up to the position indicated by the slope lines, after which the pipe is taken apart length by length back to the starting point and run down the length of the dam in the new position P 2, section B, where it is lowered to a height of 2½ feet above the beach and supported on a new trestle, the old one being abandoned and left permanently embedded in the levee. In this run the "window pipes" are replaced by ordinary pipes, the levee having been completed, and all of the material carried through the pipe is deposited in the beach, building it up 4 feet to the first lift, as shown by the line broken with two dots in section B.

The pipe is again taken apart, section by section, back to the beginning of the line, the sections being left in position ready for use again, the trestle abandoned as before, and a third trestle is provided on which the pipe is placed as shown in position P 3, section C, and the pipe is gradually extended the full length of the levee, building up the second 2½-foot lift of the beach to the position shown by the horizontal line broken with two dots, and thus completing the operations ready for the construction of another levee, and so on. In this case the slope of the beach is about 1 in 25, making it necessary to execute the work with short lifts in order to keep the width of the beach down to about 62½ feet and prevent the deposition of fine material on it.

The slope of the beach is determined by the size of the sand and gravel; when it is fine the slope is flatter, and when it is coarse the slope is steeper. The core which is built up in the pool between the beaches is composed wholly of very fine material consisting of about 85 per cent of clay and silt and 15 per cent of very fine sand, which are, when first deposited, soft and unstable and are supported by the stability of the sand and gravel shoulders formed by the beaches on both sides of the pool.

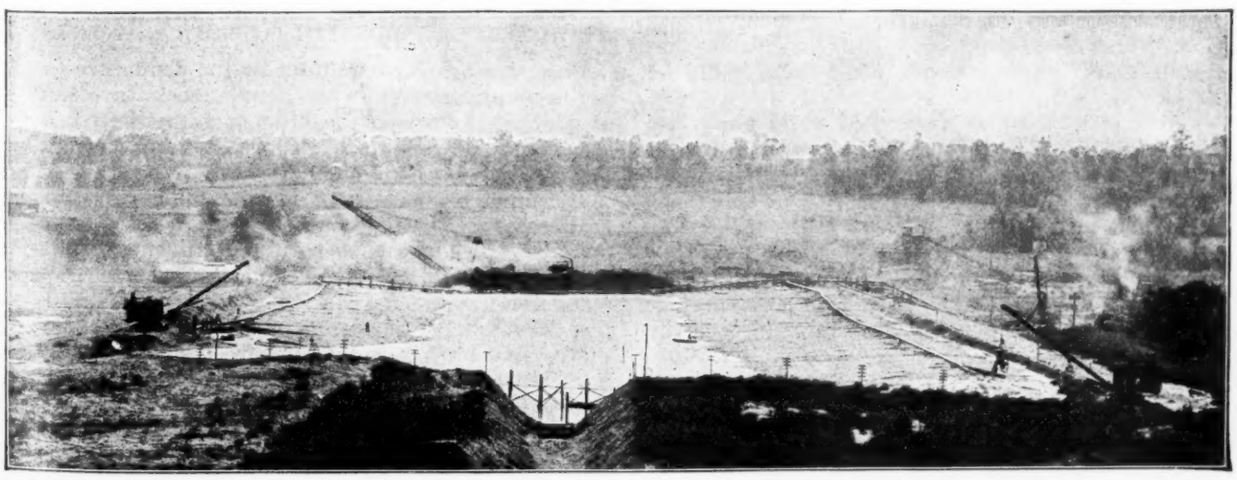
The height of the water in the pool is governed by regulating the elevation of the overflow at the lower end. When this is maintained at a high elevation as compared with the elevation of the discharge pipe through which the material is delivered to the beaches, the width of the pool is increased, thus increasing the width of the core and diminishing that of the beaches; and when the elevation of the outlet is lowered, the reverse takes place, diminishing the width of the core and increasing that of the beaches so as to give stronger shoulders, which should be proportioned according to the ratio of coarse material and fine sediment in the water from the dredge pump.



CORE SOUNDINGS IN POOL OF GERMANTOWN DAM.

The accompanying diagram indicates the varying proportions of core and shoulders which have been determined here to be most desirable, with the base of core about one-eighth the total thickness of the dam and never more than one-fifth of it.

As the construction progresses, the lower part of the core gradually becomes harder and denser until it is very compact. Its condition is determined by sounding with a 6-inch cast-iron ball, which will settle through the soft mud and finally stop in the



CORE POOL, BEACHES, PIPE LINES, AND LEVEES AT EAST END OF ENGLEWOOD DAM.
Looking down the center line of the dam, showing the "cut-off trench" in the foreground and the "cross dam" at the end of the pool.

harder material. Soundings thus taken last fall in the Germantown dam pool are indicated in the accompanying drawing, which is made with the vertical scales double the horizontal scale and with the slopes of the beaches and levees indicated by lines broken with one and two dots. The elevations where the sounding ball came to rest are indicated by black dots, the position of which shows that the material in the core consolidated with the rise of the water in the pool.

The design and construction of the dams and the details of the hydraulic fill processes have been illustrated in various issues of the Miami Conservancy Bulletin, from which this article has been prepared and the accompanying engravings reproduced.

White River Hydro-Electric Plant

Surveys have been completed for a hydro-electric plant on the White River at Cotter, Arkansas which will involve the expenditure of $15,000,000, about half of which will be required for the construction of a concrete, gravity section dam, 190 feet high and 2,000 feet long, with foundations carried into the solid rock in the bottom of the valley and in the hills on both sides.

The reservoir created by the dam will cover about 50,000 acres, perhaps 10 per cent. is now under cultivation, and will form a very picturesque lake more than 75 miles long in the heart of the Ozark Mountains. The reservoir will be supplied from the drainage of a water shed of about 6,000 square miles and will provide for an initial development of 100,000 h. p. The project is under the direction of the Dixie Power Company, organized in 1911 with offices at Cotter, Ark.

Water Power in Uruguay

The next few years will afford opportunities for the sale of many kinds of construction material in Uruguay, according to a report just issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce. The biggest single proposal under consideration is an international power plant to be erected on the Uruguay river by Argentina, Brazil and Uruguay. It is calculated that 2,500,000,000 kilowatt-hours per annum could be developed.

Other plans for development of water power are also being considered. A 37,000 acre tract not far from Montevideo is being examined by a commission with a view to irrigation to serve as an experiment and an example. Fifteen cities will install water and sewerage plants within the next few years. Pre-war estimates of this work totaled about $15,000,000. It is probable that a part of the new work will be given to American interests.

To Provide More Water for New York

In the letter tendering his resignation as president of the Board of Water Supply of New York City, John F. Galvin stated that the time was at hand for serious consideration of future additional sources of water supply for the city. The daily use of water exceeds 760,000,000 gallons and the total available supply after the completion of the Schoharie project will not be greater than 1,000,000,000 gallons a day.

Mayor Hylan, in accepting the resignation, stated that he was impressed with Mr. Galvin's recommendation for the formulation of a complete plan covering additional sources of water supply for the fast increasing population, and said that he would take the necessary steps at once to have it put into effect.

More Electric Energy for California

The Pacific Gas and Electric Company, intending within the next two years to spend $15,000,000 for additions and betterments to its gas and electric system, much of the work to be in the development of hydro-electric power plants on the Pit river, has filed with the California State Railroad Commission an application asking for authority to issue $10,000,000 of temporary certificates.

The construction plans will call for power plants developing a mininum of 350,000 horse power. Superior California will thus enjoy an increase of more than 2,000,000,000 kilowatt hours in electrical energy. This is twice the total energy marketed last year by the Pacific Gas and Electric Company.

More Power from Niagara Falls

Army engineers are expected to submit a report soon in which they will declare that there is no objection to an additional diversion of water for power development at Niagara Falls and the lower river rapids. A request has been filed for the negotiation with Canada of a new power treaty, allowing increased water diversion on both side of the Niagara river. It is possible to produce on the American side, with the present diversion, 585,000 horse power. It is believed that this can be increased to 1,000,000 horse power. The power now going to waste represents a mininum of 15,000,000 tons of coal a year, and the whole Niagara frontier is in need of power.

Temporary Disposal of Newark's Sewage

Plans are being worked out by the committee of engineers appointed by city commissioner Raymond of Newark by which the effluent from the trunk sewer may be emptied temporarily into Newark bay instead of New York bay.

It cannot be made a permanent outlet for several reasons. It would be necessary to use a large quantity of chemicals to treat the effluent, costing $300 daily. Another objection is that concerns along Newark bay and Hackensack river would protest the discharge of sewage into the bay. Furthermore, Newark bay is too shallow; and finally, the act creating the sewerage commission establishes the method of disposal.

The committee intends using Newark bay only as a temporary expedient which will permit a much earlier use of the sewer. It is understood that the sewerage commission will dredge the bay periodically as part of the operating expenses.

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Accuracy in Department Nomenclature

It seems to be quite common for cities and states to use very loosely the designations of the subdivisions of their departments or other organization units. As an illustration, we find a state board of health referring in one place to the "Plumbing and Domestic Sanitary Engineering *Division*," and in another part of the same pamphlet to the "*Bureau* of Plumbing and Domestic Sanitary Engineering." Water supply reports issued by a "board of water commissioners" often refer to the "water department" when a study of the city's form of government shows that there is no such thing. In other cases we have a report of a water department referring to a filtration "department" or business "department" as one of its subdivisions.

The matter may be one of no great importance; but too often, we fear, it reflects a looseness in organization and in discipline which can not but detract from the efficiency and effectiveness of the work of the department.

Storing Frozen Water

A new idea for storing water without the great expense incurred by building dams and reservoirs is reported from Salt Lake City as being suggested by the local head of the United States Weather Bureau at that city. The proposition is to collect, during the winter months, the various small surface streams in the mountains by pipes and lead them to sheltered basins and available gullies where the sun shines for only a few hours per day, and either spray the water from these pipes or let it run slowly over the ice already formed. The water would be so diverted to these points during intensely cold weather, and would there freeze into masses which have been referred to as artificial glaciers. It is proposed to thus convert into large masses of ice the water which runs to waste in the winter time. It is found that snow collecting in the high valleys in the vicinity of Salt Lake City does not entirely disappear until late in summer, and it is believed that water frozen into ice in this way would last fully as long, if not longer, thawing gradually during the summer and thus reinforcing the natural flow of the streams. One advantage claimed is that water so retained would not be so stagnant as when stored in quiet reservoirs.

Several communities in Switzerland rely for their water supply upon the melting of glaciers lying in the mountains above them, and there is apparently little question but that ice masses so formed in Utah mountains would similarly continue to melt during warm weather. There are, however, several difficulties which immediately suggest themselves to us. For instance, during the times of very low temperature when the glaciers are being formed, how will the authorities prevent the freezing of water in the pipes by which it is brought to the glacier sites? Would it not be necessary to keep several men continually on the spot during the freezing season, in order to direct the water to the desired points? The desire appears to be to use the melting ice to reinforce the regular flow of the streams during the dry weather of late summer, but the ice will melt when temperature conditions favor and such conditions are likely to occur before the latter part of that season. In other words, we have a reservoir with an outlet which is under absolutely no control, so that the water therefrom will at some times be going to waste, and may have entirely vanished before the time of real necessity arrives.

As to the advantage of thus obviating the stagnation in the reservoir, this seems to be based on a misapprehension, since in large mountain reservoirs there is seldom opportunity for the stagnation of water, and the character of the water is generally improved rather than deteriorated by its retention in and passage through the reservoir.

Secure Immediate Labor Immigration

Do not merely wish for immigration, or suggest it, or approve it, but work vigorously to get it and to get it promptly and abundantly. It is the great need of this country and it must be supplied to restore conditions to normal. Many important public and private enterprises are being slowed up, or postponed for lack of labor.

Large employers of labor who have recently been questioned all complain of the great scarcity of labor and the failure of formerly successful methods of securing it. Now whenever they need an extra force, they have to search for individual laborers and get them slowly, in small quantities, and at high prices instead of having an abundant supply applying for employment wherever there was word of work in progress, as was the case five years ago. The result is that the volume of work is decreased, its cost increased, uncertainty prevails, consumers suffer and capital is more and more withdrawing the support necessary to any kind of progress and construction.

We should have two million or three million more laborers this year and next to build highways, sewers, waterworks, public buildings, dwelling houses and all sorts of construction and to assist the skilled labor in the operation of public utilities and, equally important, for all sorts of agricultural, mining and other production work that is far behind the requirements.

This scarcity is universal and well recognized and

must be met like that of any other commodity, by purchase where it is to be had. Sufficient labor has never been produced in America where the developments have far out-speeded the natural growth of the population and have made conditions so favorable as to normally attract large numbers of workers from foreign countries. The obvious remedy at the present time is to continue and increase the importation of labor and there is no good reason why this should not be quickly and easily accomplished.

In a recent conference with an authoritative official of the United States Immigration Department he stated that there are undoubtedly many hundreds of thousands of foreign laborers ready and anxious to come to this country; that they are mostly of an efficient, desirable class; that agitators and undesirables are comparatively few among them, and can be easily detected and rejected; that they will come as soon as facilities are afforded and continue to come as long as the demands and inducements exist.

It is not only policy, but necessary, to bring these men and women rapidly until the economic balance is more nearly adjusted both in our own industries and in our relations with the over-populated, hungry and idle European countries. To accomplish this there are several specific requirements, first, the revision of our laws restricting immigration and foreign labor contracts modifications that will permit the entrance of some classes now debarred that would give valuable service for reasonable compensation; second, the revision of our passport requirements and the establishment of efficient bureaus for the inspection, selection, direction and classification of laborers at the foreign ports and for their distribution in this country; third, revision and improvement of our requirements and of those of foreign countries so that immigrants may quickly and easily be passed across the frontiers; fourth, the provision of abundant transportation and suitable care and supervision of immigrants until they arrive at destination; and finally, provisions for their Americanization, welfare, and distribution.

These matters should be vigorously promoted by all large employers of labor such for instance, as the great manufacturers, the railroads and other public utilities, state, and municipal organizations and officials and especially by those interested in heavy construction of all sorts that from time to time employ large numbers of unskilled labor.

Every local and national contractors' association should appoint a committee for independent effort and for cooperation with the several General Contractors' Association of America which has already inaugurated a movement of this kind which should be heartily endorsed by its many branches and continuously apply the full force of its influence at Washington and in the great cities. All of these efforts should be coordinated, joint meetings should be held, and a national federation of all employers, including those of domestic servants, should cooperate with commercial, financial, industrial, agricultural and municipal interests and with the labor organizations if the latter will awaken to the necessity of classification, efficiency, production and equity.

Important Steps in the Right Direction

Great satisfaction should be felt in the recent action by the New York State Legislature in passing unanimously a bill making all commercial agreements, all capital and labor agreements, and all other contracts to arbitrate, enforceable by law. If this bill has been so framed so as to be adequate and efficient for the purposes indicated, it is of the highest importance and marks a long step on the only road that will ever lead to sound industrial and construction relations.

It is not less important that the law should be vigorously and universally enforced in spite of the obstructions that will certainly be attempted by bosses, corrupt officials, underground politicians and labor organizations. It is merely in line with the first principles of law and equity that have been applied universally to almost every other business relation and should by no means be abrogated for any favored class. The proper enforcement of this law will, more than any other one thing, remove uncertainty and risk in all kinds of construction and productive operations and establish conditions more favorable to increased production and economy.

It remains to be seen whether it is practicable to enforce the law without supplementing it by one requiring the incorporation of all labor organizations, and thus securing something tangible with which to operate in civil and criminal litigations. The violent objection to incorporation is hardly to be distinguished from the impulse that generally governs the anonymous writer. Any men or organizations which are honest and decent will not seek to evade the responsibility of their acts.

Pipe Rolling

A convenient way of transporting short lengths of large heavy pipe, such as tile or concrete, over smooth level ground is by means of a small roller approximately as long as the pipe which is placed inside the large pipe, the latter lying on its side on the surface of the ground. The axis of the small roller projects beyond the ends of the larger pipe and is connected to a bridle hauled by a horse or mule.

As the mule advances the roller rises up to a convenient heighth on the interior surface of the pipe and the latter rolls along easily and continuously if the surface of the ground permits. This method, of course, can only be used on an approximately level or slightly upgrade.

The advance census report indicates that city populations are increasing from 7 per cent. up to 250 per cent. In the last 10 years, Springfield, Massachusetts, has gained 45.4 per cent. and is now the leading Connecticut river city. It is to be expected that the rural districts far from showing a corresponding increase may show a decrease in population, thus seriously threatening the basic agricultural production necessary to any kind of industry and national prosperity.

Bituminous Paving Suggestions

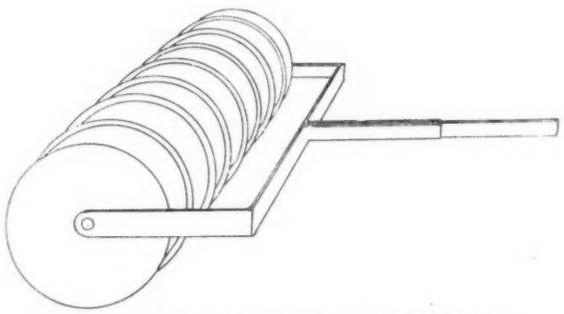
Some details used successfully by Theodor S. Oxholm—corrugating base to prevent creeping of asphalt surface, use of old macadam as base, softness of asphalt that gives the best results, and laying next to rails.

In a paper before the American Road Builders' Association, Theodor S. Oxholm, chief engineer of the Borough of Richmond, New York, described a number of details of his methods of constructing bituminous roads, which were of special interest and most of which are given in the following paragraphs.

LAYING ASPHALT ON CORRUGATED BASE.

Last spring Mr. Oxholm, at the invitation of A. Swan, Jr., C. E., city engineer of Trenton, N. J., made an inspection of sheet asphalt pavements in that city which were laid directly on the concrete foundation without a binder course. Mr. Swan explained that by the use of a special corrugated tamper designed by himself he had corrugated the concrete base so deeply and uniformly at right angles to the traffic that there had been no creeping of the asphalt wearing surface under heavy use for two or more years, and a considerable saving in cost had resulted by leaving out the binder course.

In the Borough of Richmond Mr. Oxholm has been using for some years concrete for pavement base composed of trap rock screenings instead of broken stone and sand, mixed six of screenings with one of cement. It was determined in a certain contract to use Mr. Swan's tamper. After about 300 feet had been tamped, the assistant engineer, inspector and foreman on the work devised a roller made of a 2½-foot section of telegraph pole, with bands of 1-inch round iron fastened around the roller and spaced 4 inches on centers; a long pole attached, so that the roller could move easily, completing the outfit. First, the water was squeezed out of the concrete by a light roller such as is used for concrete pavement, and then, as the concrete was beginning to set, the corrugated roller above described was rolled across the base once for each section. The result was most gratifying, as a perfect series of depressions appeared, 1 inch deep and 4 inches apart, uniform in character and extending the whole width of the base. It will readily be seen that this "washboard" surface will receive the asphalt or bituminous concrete and lock it so firmly to the base that creeping from lack of proper contact is prevented. It is thought that much of the creeping and rippling of the surface of bituminous concrete road surfaces is due to lack of proper contact with the base.



CORRUGATED ROLLER FOR MARKING BASE.

OLD MACADAM AS BASE.

Very often an old macadam road 5 or 6 inches deep makes a suitable base for a bituminous surface, provided drainage conditions are or can be made good. Care must be taken, however, in preparing the old surface, to make it as rought as possible, so as to prevent creeping of the new surface. The bond of the old pavement must not be broken, for if it is, its value is largely destroyed. Mostly all old macadam roads are now surfaced with road oil, which presents a smooth surface in patches. The best method of removing this oil surface appears to be the old-fashioned one of picking by hand lightly so as not to disturb the bond of the heavier stone. Some roads of this type which have been built by the author are quite inexpensive and are giving good service. They are edged with old stone paving blocks set in sand before the bituminous surface is applied.

The placing of a bituminous concrete wearing surface on top of an old penetration macadam road as a base is sure to result in serious damage to the pavement. Wherever an excess of road asphalt exists in the original pavement it will soften the new wearing surface over it and disintegrate it within a year.

While a liberal use of the oil burner in preparing the foundation will improve this condition considerably, yet in the author's opinion this form of old pavement provides a very poor base for a hot mix wearing surface.

Where an old waterbound macadam pavement has been covered with 3 or 4 inches of penetration macadam, and it is desired to place a new wearing surface of bituminous concrete, good results have been obtained by removing the penetration pavement entirely, and forming a new crown and repairs to the old macadam, with new ¾-inch stone and screenings.

PENETRATION TEST OF ASPHALT.

One of the most important defects in bituminous pavements, and one which is undoubtedly caused by the great loads being carried by enormous trucks, is a pushing forward of the top of the wearing surface, creating waves and ripples that sometimes are so marked that the bituminous material has to be removed and replaced. In the opinion of the author, this is caused by requiring a too high penetration test in the asphaltic cement. This has usually been placed at from 50 to 70 in cities near New York, but latterly the Borough of Manhattan has gone to the other extreme and laid pavements at penetration of 30. While the author be-

lieves that cracks in bituminous surfaces are preferable to ripples, and can be more economically repaired, yet a medium hardness should be called for. He suggests 45 to 50, and has been laying considerable pavement at 48 during the past summer.

LAYING NEXT TO RAILS.

Bituminous pavements adjoining the rails of street car tracks should be protected from disintergration caused by vibration of the rails. In many cities this has been neglected.

It is impossible properly to compact the bituminous material under the head and flange of the rails. The vibration during the passage of cars destroys the bond of the bituminous material, allowing surface water to enter the space thus formed, resulting in the final disintergation of the pavement. This defect may be obviated by the use of stretcher courses of stone blocks along both sides of the rails. The width of the stretcher area should be sufficient to permit the ordinary rail repairs to be made without cutting into the bituminous pavement.

Another method of construction is to pave up to a steel angle iron laid parallel to and adjoining the rails, the pavement then being practically independent of the railroad tracks.

Iowa Highway Commission Locates Road Material

During the past few months engineers of the Iowa State Highway Commission have been endeavoring to locate new deposits of materials suitable for road construction and to investigate existing plants for supplying such material with a view to learning the quality and quantity with which road materials could be made available this year. Their studies up to April indicated that the capacity of the various plants now producing paving materials would be great enough for the amount of work which seems probable for this season. However, transportation difficulties make it imperative to secure material as near as possible to each job.

Heretofore material from South Dakota and Minnesota has been used extensively for work in northwestern Iowa. In view of the extensive road program contemplated in both Iowa and Minnesota it seems desirable to endeavor to locate local supplies in the northwestern part of Iowa. It was therefore fortunate that a deposit of good gravel has been found on the line between O'Brien and Clay counties, which will be more than sufficient for 22.6 miles of road contemplated in this vicinity.

An immense deposit of gravel, hitherto almost unknown to road builders, has been located in Jackson county, in the eastern part of the state. What apparently totals to millions of tons of good road-building gravel has been found in a terrace which was undoubtedly the bed of the Mississippi river during a period of the Glacial Age. The river is now from a half to ¾ of a mile east of this gravel deposit and 20 or 30 feet lower. The deposit is apparently at least 60 feet deep on its eastern edge, about ½ mile wide at a maximum and between two and three miles long. The gravel is reported to be of excellent quality.

Several other new pits have been located. In general, a study is being made of available near-by material in connection with each road project, as far in advance of the letting as is possible. These studies include investigations, not only of the available sources, both developed and undeveloped, but also the quality of material, price, transportation cost and probability of delivery at required rates.

In general the price per ton of sand in Iowa averages 75 cents at the plant. Screened gravel sells at $1.50 and crushed stone at $1.50 to $2.00.

Planning an Ideal Road

The Board of Directors of the Lincoln Highway Association has sent a circular letter to highway engineers and commissioners, asking their suggestions for the construction of what they would consider an ideal road, with a view to constructing on the Lincoln Highway a section of road embodying the ideal which should finally be adopted after consideration of the various suggestions presented. A competent board of highway engineers and other authorities will pass upon the suggestions made, and will determine within the next few weeks what plan will be adopted and built. The idea is not to build the most perfect road that money can provide, but to keep strictly within the practical from a financial as well as an engineering point of view. Taking into account the traffic which may be anticipated on the Lincoln Highway during the next twenty years, the road should be that which would show the maximum ultimate economy.

The suggestions called for are not so much as to the surface material, but rather to the broader features of the design; for instance, whether there should be two traffic lanes, or four lanes, or four lanes each in a separate strip for the segregation of traffic, etc. Also width of shoulders, size and shape of drainage ditches, location of trees, hedges, lighting poles, etc., are to be considered.

This section of road is to be a model in the sense that it is hoped that it will serve to stimulate imitation by the various states, counties and communites through which the Lincoln Highway runs. This particular section will be paid for by the Lincoln Highway Association, the funds having been provided by C. B. Seger, a founder of the association and the president of the United States Rubber Company, and by J. N. Gunn, president of the United States Tire Company and director of the association.

Michigan Good Roads Association

The preliminary arrangements for the annual convention of the Michigan State Good Roads Association, to be held in Lansing in early fall, are now being made. Over 1,500 good roads boosters are expected to be present.

The tentative dates have been set for August 31, September 1 and 2. The program will include one whole day for the State Highway Department matters, the second day being devoted to Michigan state good roads and the third to snow removal and drift prevention.

One of the features of the convention will be the large exhibition of road-making machinery, consisting of everything used in road construction and highway improvement. A suitable place for the exhibit will be found by the Chamber of Commerce.

Asphalt Paving in Oklahoma City

By S. N. JOHNSON*

Oklahoma City, Okla., is starting on a program of reconstruction of streets which were paved about 20 years ago, using sheet asphalt on a concrete base. In reconstructing these, the old concrete base is to be brought to a true contour by building up the deeper depressions with cement concrete and the shallow depressions with close binder.

In the business section, where cars are parked for long periods, a gutter of three-inch vertical-fiber brick set in a mortar cushion and with grout-filler will extend from the curb 10 feet into the roadway, which is 40 feet or more wide. After the brick gutters have set, a two-inch binder course, using a lean asphaltic concrete mixture, is laid and rolled. On this binder course is laid two inches of asphaltic concrete carrying a high percentage of fine material, especially 200 mesh, with the balance of the mineral aggregate well-proportioned up to half-inch material.

The first rolling of this wearing surface is crosswise instead of longitudinal, using a five-ton roller. Because of the brick gutters, this roller can cover the entire asphalt surface with its larger wheel. Immediately following the crossrolling, a longitudinal rolling is given the wearing surface, using an eight-ton tandem roller. Up to date, surfaces completed by this method show a minimum of waves.

Another feature which, in the opinion of the writer, will eliminate to a great extent non-uniformity of surface is the prevention of the asphalt rakers from walking or standing on the hot mixture after it has been handled by the shovellers and prior to rolling. This prevents an excess of mixture in the spots which have been walked upon and which have thus received a certain amount of compression before the rolling is applied.

In this section of the country, most cities demand that automobiles be parked along the curb at an angle of 45 degrees and the gutter mentioned above should take care of this class of traffic during the summer months.

Proposed Subway for Cleveland

Cleveland is taking steps to improve traffic conditions by installing a subway system. A special election was called for April 27, when voters were asked to approve a $15,000,000 bond issue for constructing downtown subways and a leasing contract for the operation of city cars of the Cleveland Electric Railway Company. The plan is for a subway that will carry the surface cars underground from the center of the city to points beyond the congested district on the heaviest traveled thoroughfares. It is proposed to have four initial units.

*Asphalt Sales Department of the Texas Company, Western Division.

Shall We Import Chinese Labor?

A prominent engineer suggests this as a solution of the present urgent need throughout the country for unskilled labor to construct our necessary public works.

The following letter, which has been sent by the writer to a number of engineers, suggests one possible solution or partial solution of the problem presented by the scarcity of unskilled labor in this country. We will be glad to publish discussions of the idea by engineers and contractors:

I have just returned from an extensive trip covering the entire West where I found from the time I left Chicago until I reached the Pacific Coast, thence from the Mexican to the Canadian borders, that the main topic of conversation, whether it was banker, farmer, merchant or engineer with whom I conversed, was the shortage of *unskilled labor*. This because the same was not only affecting the production of their farms and their industries but because it was also seriously handicapping many large engineering projects whose furtherance was being stunted on account of the lack of economical labor as represented by *"the pick and shovel and wheelbarrow man."*

I also found that same of the thinking people of the west were endeavoring to solve the question and have started active work in sounding sentiment as regards the modifying of the Exclusion Act so as to permit the importation of a limited number of Chinese laborers to do the menial and rough work which our white labor will no longer do; such labor to be admitted under the direct supervision of a commission representative of our different governmental departments, the farming, labor and business interests of the country. This commission would supervise their employment so that they would not compete with our American labor nor reduce their standard of living. The importance of the question involved and of the movement impressed me so much that I concluded, on my return to Chicago, that I would endeavor to learn how the members of our profession feel about this all-important question.

As an engineer I am certain that you realize that it is up to us to assist in solving this vital problem of securing a source of supply of common labor which would be both economical and efficient, if we wish to see the many engineering projects, in which we are directly or indirectly interested, completed. Unless we do interest ourselves more than passively I am afraid many of the large projects under consideration will be held in abeyance because there is no question but what one of the greatest items of cost of construction today is labor.

As city engineer of Chicago for 22 years, my experiences have been many as to how the increased labor costs have affected construction. Realizing what the securing of economical labor means to the future of our profession, because of the effect the present abnormal labor conditions is having on capital seeking new development projects, I concluded that it is timely to make a survey and, appreciating your experience I am desirous of securing your valued opinion as to what your views are relative to the importation of Chinese labor under the above-mentioned conditions.

The eyes of the world are upon America. Europe has been drained of its manhood. Continental industry has been crippled beyond hope of immediate reparation and the foodless populations of devastated countries

now look to us for salvation. Shall we sit idly by and permit antiquated and perverted notions of "economic necessity" to stultify our efforts? Or shall we assert the cause of righteousness, and recognizing the needs of the hour, pronounce to the world that America is prepared to continue the pace in the race for progress already set by tireless workers of reconstruction?

As the law of supply and demand governs at all times and with the demand here and not sufficient supply available I believe it is up to us to do something. Awaiting your valued opinion, I am,

Respectfully yours,
JOHN ERICSON.

Amendment to Contractors' Relief Bill

By the act of March 2, 1919, money has been appropriated for the construction, repair and preservation of public works on rivers and harbors, and an amendment has been proposed for section 10 of this act that provides for the cancellation of all such contracts awarded but not completed before the United States entered the war on April 6, 1917. It also provides for investigations to determine additional compensation, if it should be paid to contractors, for work done between April 6, 1917, and July 18, 1918, so as to reimburse them for losses sustained on account of increased cost of materials, labor and other unforeseen conditions.

Such action is especially desirable in the case of federal contracts where the contractor is very strictly held to the letter of the specification and must generally fulfill his covenant without regard to contingencies for which he is not responsible and which, in this case, were largely the direct results of government action taken after the contract was awarded.

Stealing Men

Under this title the bulletin of the Associated General Contractors of America deprecates the custom, frequently noticed, of baiting labor away from other contractors regardless of local agreement and emphasizes the necessity of mutual consideration, honesty and cooperation to correct the evil and improve labor conditions.

In discussing the execution of construction work outside of the contractor's home district, it points out that it may be done by joniing the local association of general contractors and participating in existing or new agreements; by independent action after conference and investigation of conditions with local contractors; or by ignoring local conditions, customs, or agreements and out-bidding the existing scale sufficiently to seduce the labor from the local contractors. Instances are specified of the use of the second and third methods which resulted in unjust and harmful conditions which should be strongly opposed.

It is admitted that the present labor shortage and increasing demands for construction will often necessitate revision of existing agreements and scales, but it is obvious that such action should be of a co-operative nature, well considered and conservatively handled, and that no effort should be neglected to harmonize local and outside interests and practices, to avoid industrial anarchy and heavy losses. Where the demand is notably greater than the supply, either some extra attraction must be provided to draw labor from other localities or some work may be suspended temporarily, to maintain the existing scale and assist the balancing of supply and demand. Independent conflicting action of the outside firm should only be tolerated after every attempt at cooperative action with the local interests has been unsuccessful.

Attention is called to the procedure in this case recommended by the by-laws of the Association of General Contractors of America, which provides, in article 1, section 5, that

Firms or corporations, members of any associated organization of the Associated General Contractors of America, who shall undertake a construction contract outside the jurisdiction of the Associated Organization of which they are members and within the jurisdiction of any other Associated Organization, should affiliate with said other Associated Organization and abide by their rules and regulations at least for so long as said firm or corporation shall continue to undertake construction work within that jurisdiction.

High Cost of Labor Inefficiency

The Industrial News Swocy states that evidence submitted to British Court of Inquiry on dockers' wages showed that cost of unloading vessels is now more than four times pre-war costs, increase being due quite as much to inefficiency of labor as to higher wages; a "gang" at Glasgow formerly consisted of fifteen men and now of nineteen men.

New Immigration Commissioner

The position of Commissioner of Immigration at Ellis Island, which was vacated by the resignation of Frederick E. Howe, has been filled by the appointment of Frederick A. Wallis, New York. The importance of this position is due to the very large proportion of immigrants that pass through Ellis Island amounting to 80 per cent of the total number of aliens entering the United States.

Proposed Remedies for Labor Shortage

Practical measures to relieve the present labor shortage were proposed by The National Immigration Conference, held on April 7 in New York City This gathering included leaders in finance, industry and agriculture, together with labor men and representatives of foreign born groups in America, and was called by The Inter-racial Council, 120 Broadway. The common interest which drew these varied elements together is the need of greater production, more stable labor conditions and a better understanding between the different races living in America

Among the measures proposed was greater protection for the immigrant against fraud, extortion and violence. A Federal Assimilation Bureau should be established to look after the welfare of the immigrant, help him learn our language and place him where he can work to the best advantage of himself and the nation. Standards for citizenship should be high, but useless hindrances and red tape should be done away with.

An advanced immigration policy was advocated as a remedy for the present labor shortage, including the selection of industrious and thrifty men and women of good character, and their distribution to the points where they can do the work for which they are fitted. As an immigrant may be of great value to the country as an unskilled laborer, regardless of his inability to read, it was urged that the present literacy test be eliminated and this would open the gates to unskilled workers in agriculture and industry, construction, railroads and domestic service, where there is a great need for help at this time. Our present labor shortage is estimated at between 4,000,000 and 5,000,000 and this would be relieved by a policy of admitting immigrants without book learning, but of good character, sound body and mind and the Old World habits of frugality and industry.

New York City Wage Scale

The new wage scale in New York effective as of May 1 as approved by the Building Trades Council and the Building Trades Employer's Association follows:

Asbestos workers, boiler felters, pipe covers, insulators, $9; asbestos workers' helpers, $7; blacksmiths on building operations, $9; blue stonecutters, flaggers, bridge and curb setters, $9; blue stonecutters' helpers, $7; boilermakers, $9; boilermakers' helpers, $8; bricklayers, $10; bricklayers' helpers, $7; cabinetmakers, $9; carpenters and framers, $9; cement and concrete masons—; cement, concrete and asphalt laborers, $6.50; composition roofers, foreman, $8.50; dock builders, house shore and sheath pilers (April 1, 1920), 44 hours, $9; electrical workers, $9; electric helpers, $5.50; electrical fixture workers, $9; elevator constructors, $9; elevator constructors' helpers, $7; engineers, stationary, $9; engineers, portable hoisting, etc., $46.75 weekly, broken time, $10; excavators and general laborers, $6.50; framers, $8; glaziers, $8; granite cutters, $9; housesmiths, bridgemen and structural ironworkers, $9; bronze, metal furniture and metal trim workers, $9; housesmiths' helpers, $7; machinists of all description, $9; machinists' helpers, $7; marble carvers, $10; marble cutters and setters, $9; marble cutters' helpers, $7; marble polishers, bed rubbers and sawyers, $8.50; metallic lathers, $9; mosaic and terrazzo workers, mosaic workers' helpers, $6.50; painters (40 hours a week) $8; painter-decorator (gilder) (grainer), $8; pictorial painters, $9; plate and sheet glass glaziers, $8; plasterers, plain and ornamental, $8.50; plasterer modelers, weekly $41.25 to $130; plasterers' helpers, $7; plumbers and gas fitters, $9; rockmen, $6; pipefitters, open cut, $8; compressed air workers, riggers on machinery, dynamos, boilers, etc., $9; rock drillers and tool sharpeners, $7; roofers, tar felt, composition, damp and waterproofers, $8; sheet metal workers, coppersmiths, tinsmiths, metal roofers, $9; sign writers, letterers and stripers $7.50, subject to change; slate and tile roofers, $9; steam, hot water and general pipe fitters, $9; steam, hot water and general pipe fitters' helpers, $7; tile layers, $9; tile layers' helpers, $7; tunnel and subway constructors, $7; technical engineers, structural (38 hours a week), junior, $35; grade B draughtsman, per week, $60; grade A draughtsman, per week, $75; checkers, per week, $90; squad boss, per week, $100; designer, per week $100; upholsterers, $9.25 (40 hours per week); upholsterers on carpet and linoleum, $9; varnishers, $8; wood lathers, $9.

Philadelphia Strikes

More than 7,000 carpenters in Philadelphia are reported on strike for $1.25 per hour and a five-day week. Teamsters and lumber yard employes have joined the strike which has spread to the shipyards and paralyzed building operations. The strike is attributed to radicals on the Delaware river front but the leaders deny that it was associated with the May Day demonstration.

John Bogart

John Bogart, eminent hydraulic engineer, died April 25 at his home in New York City at the age of 84. Colonel Bogart served as an engineer in the Union army in the Civil War, was for six years chief engineer of the Brooklyn Park Commission and for the Rapid Transit Commission, and was associated with the design and construction of park systems for Albany, Chicago and other cities. He was state engineer for New York State for four years and for many years was secretary of the American Society of Civil Engineers, which is much indebted to his abilities and genial personality for its growth during early years.

Colonel Bogart built fortifications at Fort Monroe and was resident engineer of the Washington Bridge across the Harlem River, New York, which is the largest plate girder arch structure in the world and involved many interesting and important features of design and construction. He was associated with much important railroad and harbor work and was consulting engineer for various railroads and corporations.

Colonel Bogart was the engineer for the Niagara Falls Power Company, which built the first shaft and tunnel for the development of hydroelectric power at Niagara Falls, and since then has been prominently associated with a number of important hydro-electric projects on the St. Lawrence river, at the Sault Ste. Marie, in the Far West and in various other places. His wide experience, great abilities and unusually attractive personality distinguished him in a generation of successful engineers, and his loss will be deeply felt by a very large circle of friends and acquaintances.

The International General Electric Company has been awarded a $2,000,000 contract for the first electrification of a steam railroad in Brazil, consisting of a 28-mile stretch of the Paulista railway. Including double track and siding, the total mileage to be electrified is 76 miles. Electric operation is expected to begin July, 1921. Ultimately it is expected that 100 more miles will be electrified. Eight freight and four passenger locomotives will be built at Erie, Pa.

Recent Legal Decisions

RIGHT TO TAKE EQUIPMENT ON ABANDONMENT.

The Supreme Court of the United States holds, Ball Engineering Co. v. J. G. White & Co., 39 Sup. Ct. Rep. 393, that a provision of a contract for public works that in case of its annulment the United States may, at a valuation to be fixed by the engineer, take over any equipment in use in the prosecution of the work, gives it no right so to take over the property of another engaged in the work. W, with whom the United States contracted for the completion of public works after the annulment of a contract with B for doing the work, procured the United States to take implements belonging to B on the premises and allow W to use them. The United States, while claiming the right to take the implements under the contract with B, crediting B therewith, advised W that the United States would not, under any circumstances, be held liable for the seizure. It is held that W. is liable to B for the implements.

PATENTED PAVEMENT CONTRACT, VOID.

(Ill.) Ordinance providing for a patented pavement is void under Local Improvement Act, § 74, because it prevents competitive bidding.—City of Rockford v. Armour, 125 N. E. 356.

Ordinance void under Local Improvement Act, § 74, as to competitive bidding, because providing for a patented pavement, *held* not validated by Laws 1919, p. 884, permitting use of patented articles for constructing streets.—Id.

STREET CONTRACT DEPARTING FROM AUTHORIZATION, VOID.

(Ky.) Contract for street improvement at cost of more than $100, entered into with lowest bidder by chairman of board of trustees of a town of the sixth class, which was a material departure from the contract for which bids had been invited and from the contract the board had authorized its chairman to make, in that it permitted town to release contractor from use of "Tarvia X" binder, provided for by the ordinance and embraced in proposal, and to substitute asphalt binder to be furnished by city, was void under Ky. St. §§ 3706, 3707.—Staebler & Gregg v. Town of Anchorage, 216 S. W. 348.

CONTRACT PROVISION AGAINST LITIGATION, VOID.

(N.C.) Under Laws 1913, c. 150, as amended by Laws 1915, c. 191, requiring public building contractor to give bond for the payment of all labor and material, and giving laborers and materialmen a right to sue thereon, a provision, in a bond by a contractor for the construction of a school building for a city, that no right of action should accrue to or for the use or benefit of any one other than the city, is in violation of the statute, opposed to public policy, and does not prevent a materialman from recovering against the surety, since the statutory provision may not be waived by agreement.—Ingold v. City of Hickory, 101 S. E. 525.

LITERAL COMPLIANCE WITH CONTRACT.

If a bridge has been constructed, not in literal compliance with the contract, but substantially so, recovery may be had for the contract price, less the damages for the failure of a literal compliance; but where it is not built as the contract requires, or substantially so, the one for whom it was built has a right to refuse to accept or pay for it, and the contractor cannot recover the price.—Gaddie v. Hogan (Ky.), 205 S. W. 778.

REQUISITS AND VALIDITY OF CONTRACTS.

NATURE AND ESSENTIALS IN GENERAL.

(Wis.) A party asking relief from a contract freely entered into, in the absence of fraud or overreaching, does not bring himself within the field of judicial relief by showing that the result of the contract is harsh and burdensome—Sheffield-King Milling Co. v. Jacobs, 175 N. W. 796.

(N. Y. Sup.) The manner and form of payment is not an essential part of a contract for the payment of money.—Swedish-American Nat. Bank v. Merz, 179 N. Y. S. 600.

(Ky.) An executory contract which reserves to one party the absolute right to cancel or terminate the same at any time cannot be enforced, mutuality being absent.—Daniel Boone Coal Co. v. Miller, 217 S. W. 666.

(U. S. C. C. A. Okl.) Contract for certain number of cars of gasoline, having been construed by the parties as calling for shipment as ordered during a certain year, the objection of lack of mutuality, in that no time was fixed for delivery except as buyers might order, could not be sustained.—American Refining Co. v. Bartman, 261 F. 661.

(Colo.) Complaint, alleging that defendant city through its park commission made a certain contract, need not plead the commission's authority, nor other matters of evidence requisite to a valid contract.—City & County of Denver v. Bowen, 184 P. 357.

PLACE AND TIME.

(N. Y. Sup.) Where no time of payment is specified in a contract for the payment of money it is payable immediately.—Swedish-American Nat. Bank v. Merz, 179 N. Y. S. 600.

(Mont.) An option to renew a contract requires the execution of a new contract, and does not constitute a present demise; while an option to extend the term is a present demise, extending the term of the original agreement, which then becomes a contract for both the original and extended term.—Helena Light & Ry. Co. v. Northern Pac. Ry. Co., 186 P. 702.

PARTIES, PROPOSALS, AND ACCEPTANCES.

(Ga. App.) To constitute a contract, it is essential that the minds of the parties should be in accord as to the same agreement.—Guggenheimer & Co. v. Whitehurst, 101 S. E. 774.

(Mont.) To constitute a contract, the minds of the parties must have met upon the same thing at the same time, or, stated differently, a contract results only from an offer made by one and its unconditional acceptance by another in all its terms. —Koerner v. Northern Pac. Ry. Co., 186 P. 337.

(Mass.) Where a contract was not to become binding until defendant notified plaintiff of his final acceptance, if defendant sent notification of purpose to reject to person to whom plaintiff had chosen to have such notice sent, whether plaintiff received notice or not is immaterial to plaintiff's right of action, and it is also immaterial whether or not the person chosen to receive the notice was authorized to receive it or act upon it.—Massachusetts Biographical Soc. v. Howard, 125 N. E. 605.

(Tex. Civ. App.) Where it is sought to complete a contract by the acceptance of an offer, the acceptance must be in substantial accord with the proposal.—Diamond Mill Co. v. Adams-Childers Co., 217 S. W. 176.

Where in accepting offer there is any material variation or deviation from the terms of the offer, no contract will result; the proposed acceptance becoming a counter proposition, unless the proposer agrees or accedes to the change in terms.—Id.

(Mass.) In an action on a contract, which was not to become finally binding until defendant notified plaintiff of his acceptance, letter of rejection forwarded by defendant to the person indicated by plaintiff to receive it was admissible as evidence to prove defendant notified plaintiff in the manner provided of his election not to be bound by the instrument he had signed.—Massachusetts Biographical Soc. v. Howard, 125 N. E. 605.

FORMAL REQUISITES.

(Iowa) No written contract is complete without delivery, and delivery consists not in a mere nominal act of passing the paper into the hand of another, but the essence of delivery is the intent of the parties, and it is competent for them to attach thereto any conditions upon which they agree.—Herron v. Brontin, 175 N. W. 831.

CONSIDERATION.

(Iowa) To be valid and legally enforceable as between the parties, an agreement or undertaking of any kind must be supported by consideration. —State Sav. Bank of Logan v. Osborn, 175 N. W. 964.

(Mass.) An instrument under seal imports consideration.—Morrison v. Boston Ins. Co., 125 N. E. 698.

(Ky.) The "inducement" for a contract is that which influences the act, while "consideration" means the parting with something by the one from which it moves.—E. F. Spears & Sons v. Winkle, 217 S. W. 691.

(N. Y. Sup.) There is no presumption that a service mentioned in a writing whereby defendant agreed to pay plaintiff a stated sum, which service was rendered without express request, was rendered at the implied request of defendant, and so it is not a sufficient consideration to support the agreement. —Edwards v. Tennis, 179 N. Y. S. 807.

VALIDITY OF ASSENT.

(N. Y.) Ignorance through negligence or inexcusable trustfulness will not relieve party of his contract obligations.—Metzger v. Aetna Ins. Co., 125 N. E. 814, 227 N. Y. 411.

One who signs or accepts a written contract in the absence of fraud or other wrongful act on the part of another contracting party is conclusively presumed to know its contents, and to assent to them, and there can be no evidence for the jury as to his understanding of its terms.—Id.

(Or.) One of the elements respecting a fraudulent statement warranting a rescission of a contract is that the one making it must either know that it is false, or make it recklessly without any knowledge of its truth and as a positive assertion.—Palmiter v. Hackett, 186 P. 581.

(Okl.) Generally a misrepresentation of law affords no ground of relief, the theory being that all men are supposed to know the law, but it is not universally true that such a misrepresentation is not binding on the party who makes it.—White v. Harrigan, 186 P. 224.

Where one has superior means of information, professes a knowledge of the law, and thereby obtains an unconscionable advantage of another who is ignorant and has not been in situation to become informed, the injured party is entitled to relief as if the representation had been as to a matter of fact.—Id.

(Mont.) To constitute a ratification of a contract, there must be an acceptance of the results of the act with an intent to ratify, with full knowledge of all the material circumstances.—Koerner v. Northern Pac. Ry. Co., 186 P. 337.

(Wash.) Generally, a stipulation in a contract that false or fraudulent representations, by which one party has induced the other to enter into it, shall not affect its validity, is itself invalid and cannot operate by estoppel or otherwise.—Normile v. Denison, 186 P. 305.

(Mass.) Fraud is never presumed against a party, but must be proved expressly or inferentially. —Capen v. Capen, 125 N. E. 692.

(Mass.) When there is no apparent reason for one to sign a paper, except the inducement made by false representations, the inference of result from that cause may be made, in the absence of direct testimony.—Capen v. Capen, 125 N. E. 692.

LEGALITY OF OBJECT AND OF CONSIDERATION.

(Conn.) The changing conditions of life modify from time to time the reasons for determining whether the public interest requires that a restrictive contract stipulation be deemed void as against public policy, so that only the present public policy is applicable.—Samuel Stores, Inc., v. Abrams, 108 A. 541.

(Wis.) The validity of a contract is to be determined as of the date of its execution, and a contract, valid when made, cannot be rendered invalid even by legislative action.—Sheffield-King Milling Co. v. Jacobs, 175 N. W. 796.

NEWS OF THE SOCIETIES

May 18-21.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Pasadena, Cal. Acting Secretary, S. A. Sewall, 29 West 39th Street, New York City.

May 19-21.—INDUSTRIAL RELATIONS ASSOCIATION OF AMERICA. Auditorium Theatre, Chicago.

May 24-26.—NEW JERSEY STATE BUILDING TRADES COUNCIL. Atlantic City, N. J.

June 3-4.—NATIONAL, STATE AND LOCAL ENGINEERING SOICETIES. Organizing conference will be held at Washington, D. C.

June 16-18.—NORTH CAROLINA GOOD ROADS ASSOCIATION. Annual Convention, Asheville, N. C.

June 21-25.—AMERICAN WATER WORKS ASSOCIATION. Annual meeting, Montreal, Canada. Secretary, John M. Diven, 153 West 71st Street, New York City.

June 22-25.—AMERICAN SOCIETY FOR TESTING MATERIALS; Asbury Park, N. J. Office of secretary, Philadelphia.

June 22. JOINT COMMITTEE ON STANDARD SPECIFICATIONS FOR CONCRETE AND REINFORCED CONCRETE. Next meeting at Asbury Park. Secretary-treasurer, D. A. Abrams, Lewis Institute, Chicago.

Aug. 30-Sept. 3.—AMERICAN PUBLIC HEALTH ASSOCIATION; San Francisco. Office of secretary, Boston.

Sept. 13-17.—AMERICAN PUBLIC HEALTH ASSOCIATION. Boston, Massachusetts.

Oct. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Avenue, Valparaiso, Ind.

American Society Civil Engineers.

At the regular meeting in New York, May 5, a paper was presented by Allen Hazen, consulting engineer, on the subject of hydraulic fill dams. It was illustrated by lantern slides and discussed the fundamental problems in connection with the hydraulic method of dam construction, including failures, fine grain versus coarse grain core materials, and the analysis of conditions of stability.

The Southern California Association of members of the American Society of Civil Engineers has voted that whenever the annual convention of the society is held in District 11 it should be held in Houston, Texas.

Engineers' Society of St. Paul.

At a recent meeting of this society a committee report on municipal salaries recommended the adoption of the schedule reported by the committee of the Engineering Council on classification and compensation of engineers, which was adopted. In accordance with this action the City Council has recommended the modification of the present charter provision limiting the salary of appointed officers to $5,000 per annum.

Kansas State Highway Commission.

At a recent meeting conducted by the Kansas State Highway Commission and attended by contractors and material men a committee was appointed to investigate the supply of materials and co-operate with the commission to prevent the award of contracts in excess of the amount of available construction materials. It transpired that the road-building program was much greater than could be provided for by available material and transportation, and that highway construction should proceed as fast as conditions permitted, but should not be forced. The mileage now under construction in this state is about 200 miles.

National Lumber Manufacturers' Convention.

The second annual convention of the American Lumber Congress and of the National Lumber Manufacturers Association was held at Congress Hotel, Chicago, April 22, 23, and 24, with an attendance of more than 200 registered delegates from all sections of the United States. The officers elected were John H. Kirby, president; John W. Blodgett, vice-president; J. H. Bloedel, second vice-president, R. E. Goodman, treasurer, and 12 directors. Chas. S. Keith called attention to several very important reforms needed in this country the first of which were a revision of the Anti-Trust law and a revision of shipping laws.

North Carolina Good Roads Convention.

The North Carolina Good Roads Association, which has a membership of nearly 3,000 distributed through 62 counties, will be held at Ashville, June 16, 17 and 18 and it is expected will be the largest and most important meeting held in the state this year. The secretary of the convention announces the effort to have about 10 per cent of the 52,000 miles of public road in the state included in a hard-surfaced construction state system leaving about 47,000 miles of highways for the counties to construct as feeders to the state highway system which should be increased in the future. Attention is called to the fact that about $36,500,000 a year is spent in North Carolina for automobiles and motor trucks and that their tires have a life five or ten times as long on hard surfaced roads as on unimproved roads.

The Material Handling Machinery Manufacturers' Association.

A number of important committees have been appointed at the recent special meeting of the board of governors of this association; the main engineering committee, F. W. Hall of the Sprague Electric Works, chairman, is composed of the chairmen of the sub-committes on cranes, hoists and winches; gravity and power conveyors; elevators; industrial trucks; bulk handling machinery and miscellaneous equipment.

Several other important committees have been appointed with their chairman as follows: Committee to Co-operate with Technical Societies, chairman, James A. Shepard of the Shepard Electric Crane & Hoist Company; Committee to Co-operate with Trade Associations and Industries, J. H. Flynn, of the Blaw-Knox Company, chairman; Committee to Co-operate with Marine Terminal Commissions, C. A. Luster of the Clyde Iron Works, chairman; Committee to Co-operate with railroads and Railroad Commissions, Francis L. Stuart, of the International Conveyor Company, chairman; Committee to Co-operate with Civic Associations and Governmental Bodies, F. S. Chavannes of the Chesapeake Iron Works, chairman; Special Crane Committee, W. B. Clarke, of Manning, Maxwell & Moore, chairman.

National Highway Traffic Association.

The annual meeting of the National Highway Traffic Association was held in New York, May 13, routine business was transacted and addresses were made by Nelson P. Lewis, chief engineer, Board of Estimate & Apportionment, New York City, on the Effect of the Motor Vehicle Upon the Planning of Streets, by T. A. Aspell, manager truck tire sales department, B. F. Goodrich Rubber Company on Relation of Solid and Pneumatic Tires to Efficient Highway Transport, and by H. Eltinge Breed, consulting highway engineer on the Relation of Tractor and Trailer Traffic to Highway Design.

National Lime Association.

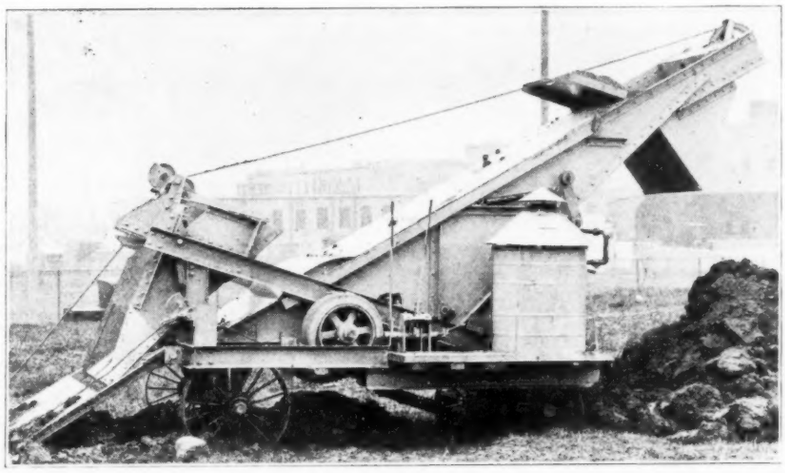
At the next annual meeting at the Hotel Astor, June 17-18, the heavy demand for lime for numerous uses, the critical car supply, and educational publicity will be discussed. The association has recently distributed for comment and criticism, a tentative agricultural lime inspection law proposed for adoption in all states administrating such regulations. It is hoped that this draft may be improved and modified so as to be acceptable to states having such regulations.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

NEW SMITH EXCAVATORS.

The New Model K excavator and loader manufactured by the T. L. Smith Company, of Milwaukee, Wis., is the result of five years of experiments and tests developing a portable dragline filling the big gap between the steam shovel and the expensive gang of hand shovelers



PORTABLE EXCAVATOR AND LOADER OPERATING DRAG LINE SCRAPER BUCKET FROM TOP OF PIT.

Portability is built into the machine, which always stays on the ground level and draws the dirt to it, eliminating the building of trestles which is required for other digging devices which go down into the hole. After the work is finished the excavator can be moved on to the next job as easily and quickly as a wagon.

Only two men are necessary to the operation of this machine, one at the operating levers and one at the loading point. At a point anywhere within 50 to 200 feet from the machine is stretched a chain, at right angles to the line of digging; upon this chain are two sheaves, hooked to the chain. Either sheave may be unhooked and relocated in an instant. One heavy cable passes from the hoist drum on the machine, then to the digging skip, then through both sheaves, back to the retrieving hoist drum on the machine.

The operator at the machine manipulates but two levers and a foot brake. As he places power on the digging line, the other man manipulates the handles on the slip so as to fill it with the material to be dug or removed. The slip has a capacity of 15 cubic feet per trip. As soon as the slip is filled the man releases the handles and allows the slip to ride to the excavator. As the slip strikes the apron at the machine it unlocks the catch of the pivot arm on the machine. The arm then carries the slip up over the machine and onto a slanting chute located on the front of the machine, from where the material in the slip discharges into the waiting wagon, truck or railroad car. The slip is then quickly retrieved to the starting point and the operation repeated.

Chicago Pneumatic Portable Air Compressors.

Bulletin 485 of the Chicago Pneumatic Tool Company illustrates and describes the new class P compressor that has been developed expressly for the contractor, and is rugged, compact and strong as the result of efforts to create a unit combining large capacity with light weight. It has a two cylinder single acting vertical air compressor with 6-inch stroke and valves designed to operate at a speed of 400 revolutions per minute, giving a capacity of 140 cubic feet per minute.

It is driven by a vertical four cylinder gasoline engine having 4¾-inch diameter x 5-inch stroke water jacketed cylinder. The fuel consumption, when operating under a full load, is 25 pints of gasoline per hour, and the engine makes 1,000 revolutions per minute. The engine, compressor and air receiving tank of 10 cubic feet capacity, are mounted on an all steel truck with metal canopy top and canvas sides and ends, which is also equipped with tool box and 20-gallon gasoline tank.

For particularly severe service, class N compressors are recommended and are of portable and semi-portable types operated by oil, gasoline and electricity.

The same manufacturers present the Hummer rock drill equipped with independent motor rotation and a simple, reliable ball valve that gives a very high drilling speed and exceptional ease of operation without vibration or kick back.

The Boyer pneumatic riveting hammers have capacities for ¾, ⅞, 1⅛, 1¼ and 1⅜-inch rivets and strike from 1,000 to 620 blows per minute. Their net weight varies from 20 to 26 pounds.

Lakewood Subgrader.

The Lakewood Engineering Company has put on the market a subgrader that runs on the steel side forms, set to exact profile grade for the road, and is drawn by a road roller. The machine has blades first set to cut about ¾ inch above the required depth, that plane off the high spots and throw the surplus material into two rows. Afterwards the subgrade is rolled and the blades trim it on the second trip to an elevation from ⅛ of an inch to ¼ inch, after which the subgrade is again rolled and the machine goes over it once more, finishing it smoothly to the exact required grade, so that the concrete may be deposited and surfaced up to accurate curve and elevation without any loss of material or irregularities requiring the work to be rejected. It is estimated that in this way the elimination of a subgrade ¼ inch lower than specified profile for an 18-foot roadway will effect an economy of $1,000 per mile.

When it is necessary for other plant to pass the subgrader, which normally occupies the full width of the road, the latter is raised on its turntable, swung parallel with the road, lowered to position on skid timbers and pushed transversely aside sufficiently to give the required clearance, after which it is returned to service by reversing these operations.

Sanitary Sewer Basin Co.

The Sanitary Sewer Basin Co., of Illinois, has opened offices at the above address. They manufacture a patented all-cast-iron sewer catch basin and an adjustable noiseless and lock-cover patented manhole.

Doughboy Jacks.

Doughboy Jacks manufactured by the McKiernan-Terry Drill Company, have been tested by the Bureau of Standards, Washington, D. C., and found to have an ultimate strength of more than twice the rated load on the toe and over three times the rated load on the head. These jacks are strictly portable, easily carried by one man and embody patented features of great practical value. They never back down, never turn around, are guaranteed to lift the rated loads, and are rugged and of simple construction and safe and convenient operation.

DOUGHBOY JACK.

The worm gear is of hardened machine steel; the top is supported on roller bearings between hardened plates; the ratchet box is entirely inclosed to keep the parts in and prevent any possible danger of injury to the operator's hand, and the pitch is such that the jacks will remain elevated under loads for any length of time without backing down a thousandth part of an inch. The entire apparatus is inclosed in a casing of cold drawn tubing electrically welded to the steel head at the top and to the steel step at the bottom. The jacks are made in five sizes, from the 25-ton jacks weighing 70 pounds to the 100-ton jacks weighing 178 pounds. Smaller jacks of similar design are furnished with beveled gears instead of worm gears.

INDUSTRIAL NOTES

Red Strand Hercules Rope.

Hercules red strand, patent flattened strand wire rope is stated by its manufacturer, the A. Leschen & Sons Rope Company, to be used in sizes of 1¼ to 1½-inch diameter for the equipment of most of the large number of drag-line electric excavators now in service on the improvements in the Miami Conservancy District, Ohio.

These machines have heavy scraper buckets up to five yards capacity operated from booms up to 135 feet long, and will eventually have handled most of the 18,000,000 yards of excavation that are required for the dams, river-work, railroad location, etc. The service is heavy and exacting and requires miles of the strongest and most reliable wire rope that is also found to be most economical in the end.

Duplex Truck Service.

The four-wheel drive trucks manufactured by the Duplex Truck Company are credited with satisfactory operation under difficult conditions as set forth in Duplex Doings. One example is that of a Duplex truck operated to serve the El Bordo Silver Mine in Mexico where it hauled loads of more than four tons over a mountain road with an average grade of 14½ per cent. and maximum grade of 21 per cent. and having twenty curves in a length of 7,886 feet.

At Griffin, Ga., one of these trucks hauled a three-blade dray machine over 36 miles of road in 8½ hours as against 3½ days when the machine was hauled by a twelve mule-team. In another case a Duplex truck hauled the 29-ton girder of a bascule bridge at North Tonawanda, N. Y. At Trevortown, Pa., a four-wheel drive Duplex truck purchased in 1918 has been operated 9,845 miles with a repair expense of only $16.85.

Maj. H. F. Hackedorn District Sales Manager for H. H. Robertson Co.

The H. H. Robertson Co. announces the appointment of Major Hillis F Hackedorn, recently of the United States Quartermaster Corps, Construction Division, as manager of its district sales office, Penobscot Building, Detroit. During his service in the army Major Hackedorn had charge of construction work at the Frankford Arsenal, Philadelphia, and the United States Government picric acid plant at Brunswick, Ga. Before entering military service he was engaged independently in extensive engineering and construction work.

Major Hackedorn is by virtue of his long and varied engineering experience well qualified to advise in regard to the use of Robertson process metal for roofing, siding, ventilators and skylights and other Robertson process products.

Bayles, G. H., has accepted a position as chief engineer of construction of A J. Krebs Company, builders, Atlanta, Ga.

PERSONALS

Gladding, Captain James N., has accepted the position of city manager of Albuquerque, N. M.

Parker, C. J., has been made chief fire protection engineer of the New York Central Railroad.

Mullekin, Alfred, has been appointed assistant sanitary engineer, New York State Department of Health.

Meikle, R. V., has been appointed chief engineer in charge of construction of the Don Pedro dam and power plant for the Turlock Irrigation District, California.

Very, E. D., has been appointed first assistant engineer, Bureau of Street Cleaning, Philadelphia.

Jones, P. F., has been appointed assistant engineer for the construction of the Don Pedro dam, Calif.

Collins, William, has been appointed city engineer of Decatur, Illinois.

McAuliffe, P. J., has opened an office as consulting engineer in New York City.

Whitner, H. F., has been appointed division engineer of highways at Blueridge, Ga.

Greenslade, William, has been appointed engineer of the Tenth Congressional District at Augusta, Ga.

McWhorter, A. W., has been appointed engineer of the Eleventh Congressional District at Waycross, Ga.

Calkins, A. S., has been appointed city engineer, Joliet, Ill.

Lough, Thomas, has been appointed assistant state engineer of North Dakota.

Firth, Joseph, has been appointed city manager of West Palm Beach, Fla.

Hamm, R. C., has been appointed engineer of Ford County, Kansas.

Kidd, Herbert L., has been appointed city manager, Kingsport, Tenn.

Murray, J. A., Jr., has been appointed principal assistant engineer, Bureau of Engineering, Albany, N. Y.

Spooner, J. P., Jr., has been appointed assistant engineer San Joaquin Company, California, in charge of highway maintenance.

Pearson Roderic has been transferred to the Missoula (Mont.) office of the U. S. Bureau of Public Roads.

Schreiner, W. R., has been appointed engineer of Summer County, Kansas

Goldberg, L. I., state engineer of Michigan Highway Department, has resigned to engage in contracting at Traverse City, Mich.